ELECTRICAL REVIEW

[ILLUSTRATED]

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A New Electric Gauge.

All persons using electric batteries have long felt the need of some simple gauge to show the condition of a cell of battery or the amount of current that is passing through a line without the aid of an expensive galvanometer which requires an experienced person to operate it properly. In electric clock lines the time that the circuit is closed does not give a galvanometer time to come to a rest, besides the resistance of most galvanometers would be fatal to the clocks, especially on short lines.

Most electric clock lines are started with more current than is necessary, and run until the battery is so low that some of the clocks stop, thus injuring their reputation. Either extreme is very expensive, as in the first place more current is used than is needed, and would soon pay for the gauge.

Telephone managers lay aside batteries nearly every day that, perhaps, are not half used up, because the transmitter does not work well. With the electric gauge an inspector can, by simply connecting its terminals to the battery, know immediately the amount of current it is giving, and thus determine its condition. An engineer would not think of running a boiler without a gauge, leaving out the matter of safety, as by it he knows whether he has steam enough or more than is necessary for the work required. The same system should be carried out on all battery lines as a matter of economy, if nothing more.

The simplicity of the electric gauge is such that any one will readily understand its working. A pair of electro magnets with extended fall pieces curved to fit its armature which is suspended from its center of curvature by suitable arms. On the same staff is a segment of a wheel which drives a pinion, to which is attached a painter. The armature is held out of the field of force by a hair spring, which is fastened to the center pinion, and is drawn within the field against the spring according to the strength of current passing through the coils. In case of heavy currents the magnets can be moved away from the armature until the pointer will register the desired number on the dial.

Anyone wishing any further information regarding the gauge, can address the patentee, C. D. Warner, Ansonia, Conn.

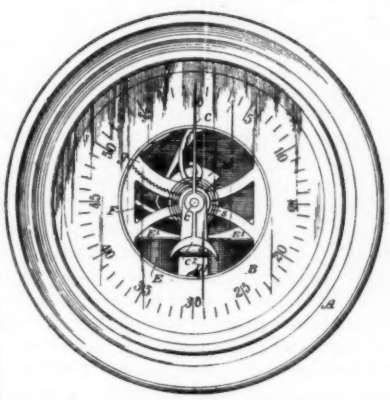


FIG. 1—SHOWING CASE, DIAL AND INDEX.

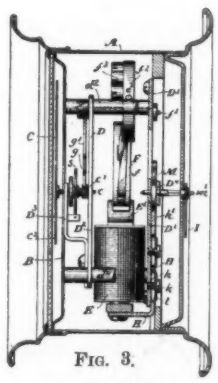


FIG. 3.

VERTICAL SECTION OF INSTRUMENT.

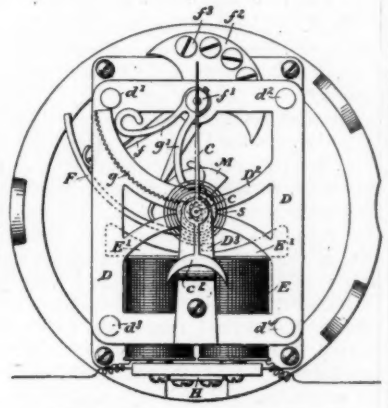


FIG. 2.—CASE AND DIAL REMOVED.

Burdensome Exactions.

The Philadelphia city government in 1881 passed an ordinance providing that "no pole shall be duly erected without the license of the superintendent of the police and fire alarm telegraph shall have been previously obtained therefor, as provided in this section, and for every license so granted shall be paid to the city treasurer for the use of the city the sum of $5 per pole." Further, it says that application shall be made for continuing the license for the ensuing year, and the charge for such license shall be $1 for each pole. The ordinance of 1883 says: "On all conductors or wires suspended above-ground, except such as are used or owned by the City of Philadelphia, an annual payment of $2.50 per mile, or part thereof, in length, of wires or conductors, shall be paid for each and every wire or conductor used or to be used for telegraphic, telephonic or other purposes." It is likewise provided by the same section of the ordinance that "failure to make payment as required thereby shall subject the offender to the penalty of $50 per month for each and every day thereafter until payment is made."

Actions were brought to recover the license fees, and also a penalty said to have been incurred by the Telephone Company.

The defendants filed answer, claiming that the municipality had no power to enforce ordinances; that the fees are unreasonable and amount to a revenue; that they exceed the rate of taxation on other property, and operate in restraint to trade, and that the companies had paid State tax on the poles and wires.

The fees claimed amount to $6,885. The referee's report says: "If the exaction of a license in any case is simply a means, in good faith, of enforcing reasonable police regulations, then such exaction is a *legitimate* use of the power to regulate. If it is an attempt to tax, then it is an abuse.

"I conclude, therefore, that the city has a right to exact reasonable license fees for the erection and maintenance of poles and wires, and the question then is, whether the fees sought to be charged by the ordinances of 1881 and 1883 are reasonable, which brings us to the third question discussed before me.

"I am of the opinion that the license fees required by these ordinances are not reasonable, and are, therefore, not within the proper powers of the police regulation possessed by the city. They are in effect an attempt to impose a tax, which the city has no right to do.

"That the fees are unreasonable seems to me to be apparent from the undisputed facts of the case. The total cost of maintaining the whole system of police and fire alarm telegraph is about $25,000. Of this only 10 per cent., or $2.500 at the most, is chargeable to the expense of supervising the erection and maintenance of poles and wires by telegraph and telephone companies. License fees which would aggregate only $2,500, or perhaps $3,500, would be a reasonable exercise of the power of regulation. License fees of which the total amounts to 50 per cent. of the whole expenses of carrying on the department are, to my mind, in the nature of a tax. This view seems to be strengthened by comparing the amount paid with the value of the property. The cost of erecting poles and wires in the city is, according to the evidence, in the neighborhood of $500 per mile. This is estimating forty poles per mile. The tax in such case would be over $40; in other words, nearly 10 per cent. of the value of the property. If it is said that the value of the poles and wires is no criterion as to the value of the property, the property being really the franchise to erect poles and stretch wires, the answer is that the corporation already pay tax on their capital stock, and that there would seem to be no authority on the part of the City of Philadelphia to do something which would practically amount to levying a tax upon the corporate franchise.

"For this reason, therefore—namely, because the license fees exacted are unreasonable as fees, and because they operate in substance as a tax—I am of opinion that the ordinance cannot be enforced, and that the finding in each of these cases should be for the defendants, and I accordingly so find."

Heating by Electricity.

Mr. J. S. Sellon writes as follows to the London *Electrical Review*:

"Public mention has been lately made of experiments carried on in France for heating railway carriages with electricity. Heating by electricity has not as yet attracted the attention which so important a subject would seem to merit, and it may therefore interest your readers to know that since October, 1883, I have successfully warmed some of the smaller rooms of my house with a very simple apparatus, as described in my patent, 'Electrical heating,' No. 4,961, 1883 (some of the forms of which are specially designed for railway carriage warming). In heating rooms by this means, there is the great additional advantage that a current of fresh air from the exterior can be passed through the electrical heater so as to enter the room at any desired temperature within moderate limits; the outside air being, say, at freezing point, can enter the room fresh and pure at a temperature of 200°, causing thorough ventilation—a matter of no small importance for sick rooms or hospitals. A modified form is used nightly in my house as a bed-warmer, the heat being turned on or off at the bedside at any required moment—a great convenience for invalids. As a minor use, I also employ the same principle for a chicken incubator, and it is especially applicable to the French system of 'thermostatic' nursing, avoiding the noxious fumes of gas or oil at present employed.

"An ordinary foot-warmer for railway carriages is a very simple adaptation of the same principle; but, if desired, fresh warmed air can be admitted, and the temperature of any closed carriage be regulated by the form used for chamber heating. When once the electric current is furnished to railway carriages for lighting purposes, which cannot be long delayed, this will doubtless prove to be a very convenient and cheap method for heating them. If the arrangement is fitted to permanent receptacles containing salts, such as acetate of soda, the heating of carriages can be carried out with still greater facility and convenience, and at a very low cost.

"With the further exception of the system patented by Mr. Oswald Rose in May, 1882, I have no knowledge of any other attempts to deal practically with the subject."

The good people of London are disturbed because the use of the "ticker" gives outsiders the same chance to speculate that the members of the Stock Exchange enjoy. Says the London *Electrician*: "We recently had occasion to denounce gambling by telegraph; and we would now call attention to another species of the vice, as real, if not so ostensible. Since the hourly variation of prices at the Stock Exchange has been telegraphed to a dozen different offices in the city, outsiders have been enabled to deal almost as closely as members; and their number has increased while their status has decreased in inverse ratio. The Committee of the Stock Exchange have this matter under consideration; and it seems not unlikely that the "tape system," as it is called, will be excluded from the hallowed precincts of the Exchange—that is, supposing the Committee are in earnest about the matter, and the outside gambling fraternity does not prove too powerful."

"Cannot the science of the present day provide a means of taking the life of such as are condemned to die in a less barbarous manner?" is the inquiry of Gov. Hill, of New York. What more scientific method can be devised than the application of electricity as an executioner? Persons who have read the series of interviews with electrical experts which have recently appeared in this journal must have observed that an electrical current of 1,000 volts is considered the maximum which the human system can

receive without fatal results, whereas the wires which feed the lamps with which our streets are lighted carry a current of 2,300 volts. How simple a process it would be to connect the place of execution in the Tombs with the system of electrical street illumination, so that electricity could be made the executioner of murderers! The criminal would be placed in a chair with his head bound back against a bulb at the end of the wire through which the fatal shock would be communicated, and it would be possible to furnish the death seat with an automatic attachment so that the execution could be effected at a given moment by the action of a clock-like apparatus, and without the least movement of the hand of the officer charged with the infliction of the death penalty. What more scientific method than the one here proposed can be devised? Death would be instantaneous and perfectly painless, while at the same time the awfulness of the penalty thus inflicted would be profoundly impressive.

Secondary Batteries.

Mr. Bernard Drake, Managing Engineer of the Electrical Power Storage Company, writes as follows to the London *Electrical Review*:

On the 19th inst. you published an article on the electrical tramcar recently built by the Storage Company, in which you gave certain figures as to the depreciation of the cells, which are likely to be misleading.

You say that owing to a new design lately introduced, the useful output for a given weight has been increased, without in any way sacrificing the *durability;* and later, that Mr. Reckenzaun has based his figures for working cost on a depreciation of 50 per cent. as a safe limit.

This would naturally imply that the cells used for lighting purposes would depreciate in the same ratio, which is far from being the case.

The type of plate manufactured by the Storage Company enables the conductor, and the active material, to be disposed to the best advantage, but the proportions are varied according to requirements.

The accumulators supplied for lighting purposes are made with a view to obtaining great durability coupled with a high effective return; whereas in the tramcar cells the first consideration is a rapid discharge from a minimum weight.

In the latter case the metal is distributed where most needed, but the same durability cannot be expected as with cells designed for lighting, or other purposes, where weight is of minor importance.

We have every reason to hope, however, that Mr. Reckenzaun's allowance for depreciation will be more than ample, as the cells which were first made have been in constant use for over three months, and show no signs of deterioration.

It is impossible to say definitely what the life will be of the plates manufactured for lighting purposes with the latest improvements, but it may be mentioned that, even with the older types, the positives frequently lasted 18 months, and there is little doubt that this will be exceeded with the plates now being supplied.

The depreciation is confined almost entirely to the positives, and the company has already made arrangements to meet their customers in this respect by quoting a special price for renewal plates.

The Most Recent Naval Battle.

Le Temps, Paris, notices an account of the fighting in the Min River, published in pamphlet form at Shanghai, China, by James F. Roche and L. L. Cowen, U. S. N., who were present during the action between the French and the Chinese. Aside from the detail of the forces engaged on both sides and the skill of the naval combatants, which give us no new information, there is, says *Le Temps*, one point which deserves special consideration. These officers state that the result of the fight in favor of the French fleet was due to its armament of revolving cannon and the superiority of its torpedo service. They consider that these are the only points upon which instruction may be gained from this action. "The power of revolving cannon," they say, "their inestimable value in naval engagements, and the importance of a well organized torpedo service were plainly visible to all naval people." Before the shower of shell fired by the Hotchkiss revolver cannon from the tops of the French vessels the enemy went down like grain before the scythe. Reliefs could not get on deck fast enough to fill the gaps in the ranks of the Chinese gunners. The little shells pierced the rails and bulwarks of the vessels, and their explosion spread death in all directions. The torrents of fire poured into the Chinese vessels were so murderous that it is safe to estimate that 800 men out of the 1,000 manning the Chinese squadron were killed.

The importance of the role of revolving cannon in naval engagements was as fully appreciated, also, by the English officers who witnessed the fight. It is scarcely necessary to state, says the *Temps*, that the French officers who made such brilliant work with these guns have made a most thorough report with regard to their value. Nevertheless, the lesson to be learned by this combat is that hereafter no vessel can go into action if the guns which it has mounted on open decks are not protected against the effects of rapid-firing guns. It is therefore necessary that every piece of artillery should be covered by a metal shield as a protection against rapid-firing guns; that the gunners should be equally protected, not against the effects of heavy projectiles, which would necessitate covering the vessel completely with armor, but against machine gun fire directed from the enemy's tops, which send in showers of projectiles whose explosion would render totally untenable the decks of most vessels.

The caliber of the Hotchkiss revolver cannon which formed the auxiliary armament of the French vessels is 1½ inches and the length of bore 29 inches. They weigh 450 pounds, and fire a shell weighing 1 pound with a bursting charge of three-quarters of an ounce.

The Fire Waste of the Country.

Mr. J. C. Hexamer has been delivering a series of lectures before the Franklin Institute, of Philadelphia, on the fire waste of the country.

His lectures have received considerable attention, and the *Fireman's Journal*, of this city, from whose columns the following is extracted, considers Mr. Hexamer's lectures full of practical suggestions. His lecture last week was on "Fires in Textile Mills," the special feature of it being on the construction of such mills with a view to fire prevention. The lecturer said that one of the most important precautions to be observed in erecting mills was to insure the confining of a fire to the apartment in which it originates. All stairways and elevators should be built in a shaft beside the building proper, the openings between them being shut off at the different floors by iron doors. The next precaution to be observed is in the construction of the floors. The best form of fireproof floor is of brick arches built between iron girders placed at short distances. Floors of concrete or "terra cotta lumber," a porous clay material that can be readily cut and shaped with edge tools, rank next in security. If ceilings are of wood, they may be covered with fine wire netting and plastered over, or they may be rendered practically 'fireproof' by coating with asbestos paint or by liberal and frequent applications of common lime whitewash. Additional loss is frequently caused by having floor beams so deeply embedded in the side walls that when they burn through in the middle the weight upon them causes the overthrow of the walls when the floors fall in. This can be easily avoided by placing the joists so that they fall out when burned through in the middle. Fire doors are best made of heavy wood, covered on both sides with sheet iron and fastened to the brick wall. Two fruitful causes of fires in mills are the lighting and heating arrangements. Hot water pipes are the safest, steam pipes ranking next. To avoid having combustibles placed in contact with them, they should be suspended from the ceiling, where they are out of the way and give the best heating results. The electric light is commended by him as the safest light to use in all cases.

DETROIT, MICH., Jan. 4th, 1885.

Editors of the Electrical Review:

DEAR SIRS,—I notice in your weekly journal of Jan. 3d, an article written by Mr. E. W. Claypool, upon my system of protection from lightning, and as Mr. Claypool does not understand the principle upon which the Chambers Lightning Rod protects, I would ask you as a favor and in justice to myself, to please give me space in your very valuable paper to inform your many readers, as well as Mr. Claypool, how it does protect. The gentleman thinks the lightning strikes one point and goes off at the other, this is not the theory upon which it protects. How does it protect?

By induction and the power of points: 1st, All insulated conductors placed between an electrified cloud and the earth (or house top) receive electricity by induction, and a pair of poles developed thereon invariably at the same moment the upper end (or points) will be negative and the lower end positive, if the cloud holds positive electricity, and the reverse if the cloud is negative. 2d, The Chambers protector prevents the development upon the object to be protected the electricity of the opposite name from that in the cloud. 3d, The Chambers protector acts through induction, and induction acts at a great distance. The Franklin rod acts by conduction, and attracts a stroke, for says the late Prof. Henry "The fact is established by observation, experiment, and theory, that the common style of (ground connected) rods does attract the lightning, and receives the discharge not only silent, but explosively." 4th, The Chambers protector neutralizes and lessens the electric stress or tension by decomposition and dissipation; the Franklin rod increases that stress by concentrating the electric energy. 5. The Chambers protector dispels the accumulation of electricity by repulsion; the Franklin rod accumulates it by attraction.

Faraday proved that "The air is an active and essential agent in the process of induction, one half of every molecule of the air becoming positively and other half negatively charged, and hence carrying off the electricity opposite to that of the cloud" from the points of an insulated rod. Although nearly all the prominent authorities in electrical matters have taken pains to emphasize the power of a point, both in accumulating and dissipation of electricity, yet I find no part of the subject of electricity so meagerly apprehended as this same power of a point, and this results probably from the use of a single word in connection with the definition and demonstration of that power. "Infinite" is a word that without an arrest of, and concentration of, thought upon that one expression, conveys no clear definite impression into the mind. It leaves no abiding trace behind it and yet this is the word used by Gordon, and others, as the power of a point. Infinite in power to accumulate and infinite in its power to dispose. These are seemingly contradictory terms and attributes. Silliman says (Physics, p. 542) "The power of a point in concentrating electricity is such that the excitement passes off as rapidly as it accumulates to the nearest bodies or is diffused in the ambient air. The fact follows as a consequence of the tendency of electricity to accumulate at the small end of an ellipsoid, the ellipsoid may be so elongated, that the electricity escapes." Gillman in his Forces of Nature, says: "We see, therefore, what a great influence form has on the distribution of electricity, but nowhere is this influence so perceptible as on the part of bodies terminated in abrupt edges, acute angles and conical or pyramidal points." At these parts *electricity accumulates* and acquires sufficient intensity to pass into the surrounding medium, even when this medium is only to a slight extent a conductor. It has been calculated that at the tops of a conical point, the electric tension is infinite, so that it is impossible to charge a body so armed with electricity, and this is confirmed by experiment. In proportion as the electricity is developed, it escapes into the surrounding medium and disappears. Jenkin in his Electricity and Magnetism, page 105, says: "That a prominence armed with points can no more be highly electrified by induction, than a leaky bucket can be filled with water." Gordon in his work on magnetism and electricity gives the mathematical demonstration of the power of a point to first concentrate and then disperse electricity, but perhaps the authority and explanation of Faraday is as clear and succinct as can be given. On page 145, of the translations of the Royal Society, for the year 1838, being the 13th paper presented by Michael Faraday, you will find the following: headed, "*Action of point situated upon an insulated conductor.*" Particles are brought by inductive action into a polar state, and the latter, after rising to a certain tension, is followed by the communication of a part of the force originally on the conductor; the particles consequently become charged, and under the joint influence of the repellent and attractive forces, are urged towards a discharge place, or to that spot where the inductric forces are most easily compensated by the contrary induction forces. Why a point should be so exceedingly favorable to the production of currents in a fluid insulating dialectric, as air, is very evident. It is at the extremity of the point necessary to charge that the air is first acquired; it is from them that the charge particles recede; and the mechanical force which it impresses on the air, to form a current, is in every way favored by the shape and position of the rod.

At the same time, the point having become the origin of an active mechanical force, does by the very act of causing that force, namely by discharge, prevent any other part of the rod from acquiring the same necessary condition, and so preserves and sustains its own predominance.

The very varied and beautiful phenomena produced by sheltering or enclosing the point illustrates the production of the point exceedingly well, and justifies the same conclusion; for the current may be interfered with by stopping the access of fresh uncharged air, or retarding the removal of that which has been charged; or the electric condition of the point itself may be altered by the relation of other parts in its neighborhood, and also rendered electric, as by the surrounding air which has been charged, but cannot escape. The Chambers rod is insulated from the house, having no ground connection, and in the language of Prof. Jenkin, the intimate friend and co-laborer of Faraday, "If points are attached to an *insulated conductor*, and held near an electrified body, they become charged by induction with the opposite kind of electricity. This passes off in a silent discharge, and leaves the insulated body.

The principle upon which the Chambers protector is constructed is not a hypothesis, nor a theory even, but a scientific truth, verified by facts and demonstrated by experiments. The rod is so constructed that by the inductive action of the cloud, an intense negative charge is evoked on the upper part, and an equally intense positive charge upon the lower, and confronting the negative charge upon the roof of the building or highest point, the points or upper part will so act by hurling up negatively electrified air and vapor, so as to neutralize the positive on the air or vapor above, and the lower part of the apparatus by hurling down positively electrified air and vapor, so as to neutralize the negative charge upon the roof, or highest point of the structure. A disruptive discharge of lightning between the cloud and any object on the earth may be avoided in two ways—one by connecting the *cloud* with the *object*, by any good conductor, the other by preventing the electricity of the cloud from disturbing the equilibrium on said object, or preventing the opposite pole or electricity from being developed on the object to be protected. The Chambers rod prevents the opposite pole from being de-

veloped upon the building. I hold these principles and consequent actions to be indisputably true, and I challenge and defy any one to successfully contradict or disprove them. If neither can be impeached, then inevitably no discharge can take place upon, or from, the structure so protected.

Very respectfully,

J. C. CHAMBERS.

Applications of Trouve's Lamps.

We illustrate herewith some practical applications of Trouve's portable lamps, which were recently mentioned in this paper.

The first view shows an employe of the Compagnie Parisienne du Gaz making use of the electric light under the form of an incandescent lamp, fitted into a powerful conical reflector, and worn on the forehead, so as to throw its rays on the spot to which the sight is directed. The current is supplied from one of Trouve's portable bichromate batteries, slung across the shoulder. The man is in a subway, searching for a leak in the gas main, so that it may be reasonably supposed that the atmosphere is so highly charged with gas as to be explosive; but there is no danger of ignition even if the lamp were to burst, because it is surrounded with an outer glass, while the space is filled with water or nitrogen.

The second view shows another of the Paris Gas Company's men lighting a street lamp by means of an electric lighter, supplied with current from the battery of the portable lamp slung over his shoulder, and which may be so arranged as to shine or not as required. The remaining figure shows the arrangement of carriage lamp, which is self-contained with battery, and may be used with the existing lamp sockets. The light is five or six times as powerful as that of the ordinary candle lamps, and permits, it is said, of reading inside the carriage at night. Large numbers of carriages fitted with these lamps may be seen on the Paris boulevards. There is yet another and very important application of the Trouve self-contained portable lamps, and that is in theaters, which are still lighted by gas instead of by the safer and more wholesome electric light. A few of these lamps disposed about the auditorium would be consuming no battery force until wanted; but, on an extinction of gas occurring, they would, when taken up, reassure a panic-stricken throng, and probably prevent one of those catastrophes of which only too many have lately occurred.

A note in *L'Electricien* on these lamps says that the domestic battery, charged ready for working, weighs 3.5 kilogrammes (7¾ lbs.) It contains six bichromate elements in tension, each one of which consists of one zinc and three carbon cylinders, with a provision of 100 cubic centimeters (6 cubic inches) of solution. The weight of each zinc cylinder, amalgamated with from 8 to 10 per cent. of mercury, is 85 grammes (1.312 troy grains), or 500 grammes (1.1 lb.), for the six elements. The E.M.F. was found at the Ecole de Physique et de Chimie Industrielles to be 1.9 volt, and the resistance 0.35 per element. Under the conditions of maximum power, they can, therefore, give out 3 amperes Actually, the six elements coupled in series on the lamp yield an available current at the terminals of 8.4 volts at 1.2 ampere per element.

Luminous Phenomena of Electrolysis.

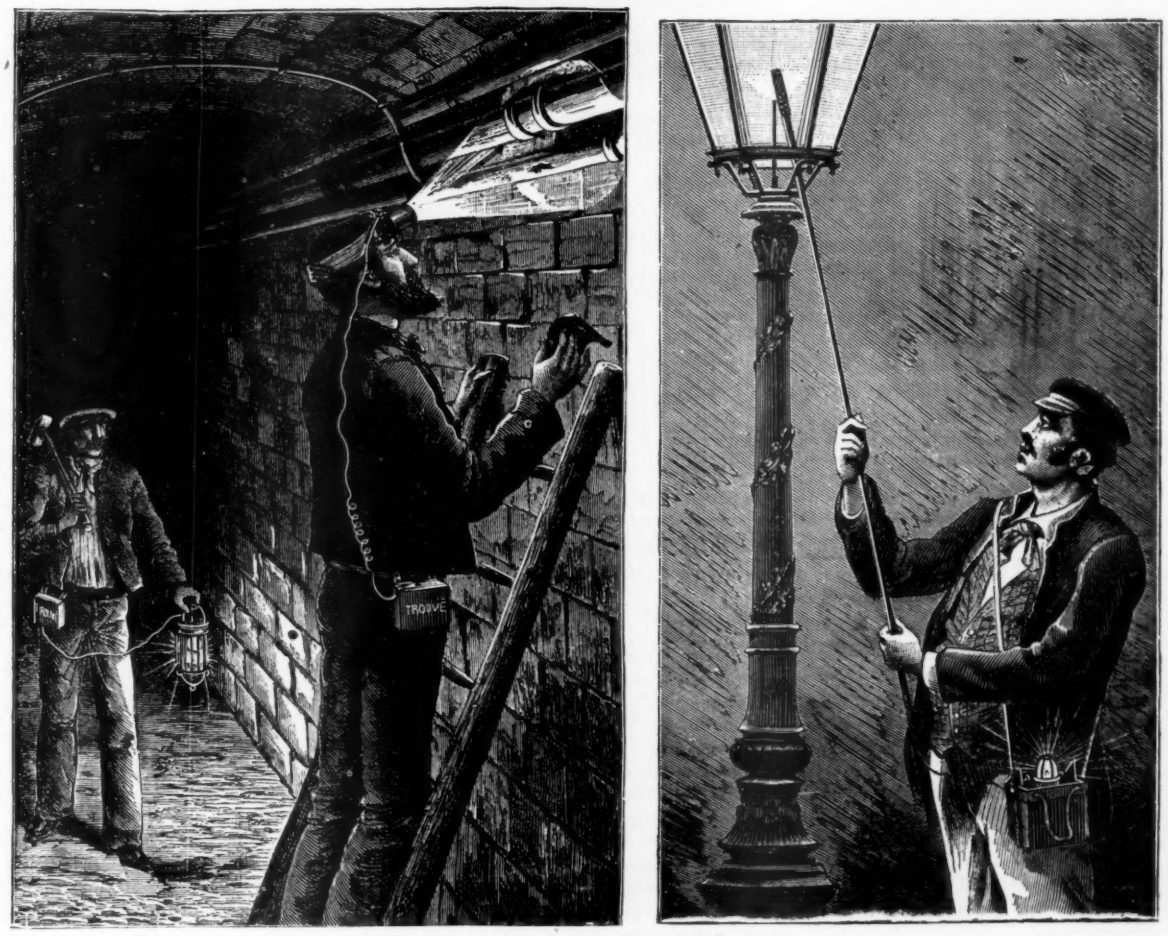
If acidulated water be electrolysed by an intense current—1 to 5 amp—with the aid of two platinum wire electrodes, and the circuit be closed by slightly immersing the cathode, a greenish light will appear at the cathode, an energetic disengagement of gas ensue, the platinum and the liquid become heated, and the force of the current diminish considerably. If the current be rendered sufficiently intense, the noise will suddenly cease, the light become stronger, and the liquid assumes a spheroidal state, leaving the cathode, and forming round it a kind of funnel.

During the continuance of this phenomenon, gas will be disengaged normally at the anode; but, if the immersed surface be diminished, the action will be reversed, provided the current be sufficiently intense. The Russian *savant*, Slouginoff, has inquired into the conditions which determine the production of this kind of abnormal electrolysis, its causes and effects, and arrives at the following conclusion:

When the platinum of the cathode has closed the circuit by its contact with the liquid, the elevation of temperature at the point of contact may become sufficiently great to evaporate the nearest particles of the liquid in such a manner as to again interrupt the circuit. The extra current increases the effect which is reproduced the following second, when the liquid, thrown off by the vapor generated, again comes in contact with the cathode in such a way that the intermittences of the current are repeated indefinitely. A greater intensity of current produces a truly stable spheroidal condition. This explanation is borne out by a series of facts, ascertained by experiments, of which the following are the principal. A telephone, placed in one branch of the principal circuit, or in the secondary circuit of a Ruhmkorff coil introduced into the principal circuit, causes a more or less loud sound during the abnormal, energetic electrolysis: but this sound becomes scarcely perceptible while the spheroidal state continues. The introduction of a coil into the main circuit, and also that of an iron core into this coil, increases the intensity of the sound, while at the same time lowering the note; and the extra currents, intensified by the coil, permit of the phenomena taking place with a less number of elements. Kœnig's revolving mirror decomposes the light of the electrode into a series of sparks, the configuration of the image showing that the sparks succeed one another round the electrode along a trajectory, in the form of a spiral. The luminous electrode is quickly disaggregated, the liquid after the experiment containing a black powder, which is found to be platinum black. The spectrum of the light from the cathode is continuous; and in the case of very intense extra currents a few platinum lines and traces of the hydrogen spectrum may be seen.

If a solution of cloride of platinum, gold, or silver (in the hydrochloric acid) be adopted for the electrolyted, a very vivid light is obtained, produced by the incandescence of the powder from the reduced metal, which, after the experiment is found suspended in the liquid.

Prof. Nipher, of St. Louis, Mo., delivered the first of a series of lectures at Washington University, Mo., last week on the subject of electricity and magnetism, to an intelligent audience.



PRACTICAL APPLICATION OF TROUVE'S LAMPS.

He did not want his audience to imagine he could explain all the phenomena of magnetism and electricity, but simply that he was prepared to show some of the results scientific men had been able to obtain during their patient investigations. We could not tell what electricity was, and were unable to define life. For this reason it was asserted by some that electricity was life. Laying aside these suppositions, he proposed to discuss simply the properties of electricity. He said that when we explained a phenomenon which we were unable to understand, we simply compared it with other phenomena that had ceased to be looked upon by us as wonderful. He then gave a short sketch of the development of the electrical science. The ancients had contributed but little to the knowledge of electricity, and what little they did discover was so thoroughly wrapped up in mysticism that it could not be utilized by the modern student. During the middle ages electricians spent their time in trying to set each other right, and but little was accordingly accomplished in that period of the world's history. It was an established fact that an electrified body attracted all lighter bodies. When we desire to electrify a body, we find it necessary to electrify it on poor conductors, and when two bodies are electrified by being rubbed together they are electrified in the positive and negative forms. If we could pump heat from one body to another, the temperature of one would be increased and the temperature of the other diminished, but whether there would be actually any very marked difference between a very hot and a very cold body was a question, at least, so far as some of the results produced were concerned. A very cold body would produce the same effect upon human flesh as a very hot body. A very cold body would burn as well as a very hot body. This was why the iron on every ship that voyaged into the Arctic region was covered to protect the crew. The word potential when applied to electricity meant substantially the same thing as temperature when applied to heat. When the potential of one body was greater than that of another, electricity would pass from the body having the greater to that having the smaller or lower potential, provided it had a conductor. The difference in the potential of clouds under certain conditions produced the phenomena of thunder and lightning. When the atmosphere between the clouds yielded to the stress caused by the difference in their potentials, it became highly rarified, and served as a conductor for the electricity to pass from one to the other. This produced the lightning flash. When the breach in the atmosphere closed with great concussion after the electricity had passed, thunder was produced. When we rub two bodies together we know that a current of electricity passes, but we are not able to ascertain which body has the greater potential. The direction of the current between two bodies charged with electricity, scientific men had never been able to ascertain. This was a problem they were trying to solve at the present time.

—— Signor Paolo Gadot is stated by *Il Giorno* to have invented some new secondary batteries which have an electrical capacity almost double that of the Faure Sellon accumulators. He makes four types, suitable to domestic applications, such as lighting, electro-deposit, and the working of small motors. The lead electrodes are, as usual, coated with oxide, but are immersed in a liquid, the composition of which is at present kept secret, and which, while effecting depolarization, facilitates the attack of the metal plates.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Mr. J. Viennot, 150 South Fourth Street, Philadelphia, is our accredited representative for Pennsylvania.

Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, JANUARY 24, 1885.

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The Great Southern Telephone Company, of New Orleans, has adopted a policy which we think cannot fail at an early day to bring them very handsome returns. They have laid out a system of lines connecting New Orleans with the principal plantations, which will place the planters in communication with their markets. This system will bring the telephone company a large revenue not only from the line and instruments but by increasing the advantages of the exchange to the merchants of New Orleans will largely increase the profits there. The expense of this large extra amount of construction once passed there will be no question as to their ability to pay dividends at an early date.

The New York Legislature will undoubtedly "tinker" the absurd and inoperative Daly "underground bill" of last winter. The Brooklyn authorities, who, though it affected their interests seriously, never paid any attention to the bill until it got upon the statute book, and then, when it was a law, they found that it imposed obligations upon them which it was utterly impossible for them to fulfill. It is fair to presume that they will be represented at Albany this winter, and at least look after their own interests. And the city of New York, if it be wise, will follow suit. Are there not, by the way, some companies that have an interest in this matter? And if they pull together, will there not be more chance of success than if they pull apart?

Does it ever occur to those who are so clamorous to have all electric wires put underground, to inquire where all the funds for this expensive work, whose utility is at best a matter of doubt, is to come from? It is all very well to say that the companies must provide it, but where are they to get it? By issuing additional stock? By borrowing? In any case it must come eventually out of *earnings*, out of the customers of the several companies—in a word, out of the *pubic*. If, as the result of the clamor, much of which, we still insist, is unreasonable and without tangible basis, the companies are driven to a heavy expenditure, the result, in the end, must be to increase to the public the expense for telephones, for electric lights, and for telegraphic service, while such things as "tickers," district telegraph, and time telegraph service would be practically wiped out. Perhaps it is just as well to think of these things *now*.

ARE TELEPHONE RATES EXORBITANT?

In its current issue, the *Scientific American*, at the close of a long and interesting article reviewing the Drawbaugh case, says:

"After Drawbaugh himself, perhaps the public will have been the greatest loser by the recent decision, for, had the general principle of the telephone been thrown open, rival companies would have entered the field, and rates for telephonic service, *now so exorbitant*, would have been reduced to a reasonable figure."

The italics are our own. Discussing the Drawbaugh case is now a harmless historical pastime, but an assertion so flatly made as that which we have italicized is worthy of comment.

As a matter of course, rates paid by subscribers are largest in the large cities, because there the largest amount is given for the money. New York City leads. The Metropolitan Company has in all nearly 5,000 subscribers. Each of these has the right to call up any talk with any one of the remaining 4,999 at any time, day or night, and as often as he chooses. For this he pays $150 per annum, or forty-one cents per day for every day in the year If the principles which this service affords him the opportunity to communicate with any one of 5,000 people, and to have any one of them communicate with him, saving time, trouble, and expense in a hundred ways, is not worth forty-one cents a day to him, it would be the part of wisdom for him to dispense with the instrument altogether.

But this is an extreme rate. With three or four exceptions, the rate in no city in the country exceeds $75 per annum, and in the vast majority it is not over $50, say fourteen cents per day for each subscriber. This is too small a matter to go into a firm's expense as a separate item; it ought to be lumped with postage and such petty expenses. Nor do the results show that the rates now charged are fairly remunerative to the companies now doing business. Expenses of construction and of maintenance are far greater than original estimates supposed, and, inasmuch as the public, moved thereto by the press, is clamoring for a "reform" in the way of underground wires, which will increase the cost of the plant at least fourfold, it is reasonable to suppose that the rates charged by telephone companies, if the business is to be conducted so as to yield a margin of profit, will have to be materially advanced.

THE ELECTRIC LIGHT CONVENTION.

The brief announcement contained in our last issue, to the effect that a convention of companies doing an electric lighting business would be held at the Grand Pacific Hotel, in Chicago, on Wednesday, February 25, was all that we were able to get into our columns in the brief time at our disposal. The form was on the press, and at the last moment the few words announcing the fact were sent to the printer.

The movement seems to us an eminently wise one. There are several hundred electric lighting companies in this country, widely scattered, each working according to the light which its own experience, necessarily limited, has given it; and each seeking, singly and alone, to solve the many problems and overcome the many difficulties which a new business naturally develops. These problems and difficulties are quite as much in the business as in the electrical department. They concern relations with customers, with underwriters and with municipalities. Difficulties grow out of legislation, not necessarily unfriendly, but often burdensome, because based on misinformation or want of information. The competition of gas companies is a legitimate one—a thing to be expected and looked for—and, by proper handling, to be not only met, but overcome.

In what may be called the practical part of the business there are quite enough topics to be discussed without trenching upon those which affect the relative merits of different systems. We take it that all the men engaged in any business know more than any one man knows; and we also assume that, looked at in the large way, it is for the interest of every company doing an electric lighting business to have every other company attain the highest possible success, to the end that the business, as a whole, may be not only profitable, but reputable, and stand well in the estimation of all. Whether the company in New Haven, for instance, uses the Weston or the Brush system is a matter of comparatively small importance to the company doing business in Omaha, but it *is* a matter of importance to the Omaha company to know that the New Haven company gives good service, that its lights are popular and in demand, and that it gives its shareholders adequate dividends upon the capital invested; and as the Omaha company in no way competes with the New Haven company, and as, moreover, it is for the interest of the New Haven company to have the Omaha company attain a like measure of success, it ought to be glad to confer with the latter and relate its experience.

Nor is it to be supposed that the Omaha Company (we have selected these two cities hap-hazard, by way of illustration, irrespective of the facts in either case), nor is it to be supposed, we say, that the Omaha Company has nothing to contribute. On the contrary, it is more than probable that its experience has developed some expedients, some methods, some economies which it would be well and valuable for even the most successful companies to know.

Nor is it alone for the interest of the companies engaged in lighting that such a convention be held. The so-called "parent" or manufacturing companies have a deep interest in it. Successful and profitable operation by the lighting companies induces a greatly increased amount of lighting, and consequently, a greatly increased amount of orders for apparatus. As to the favor shown by purchasers for one "system" over another, that must depend upon quality, terms and price, a matter of open business competion, just as it is with engines, with boilers, with carbons, and with all the different articles which go to make up an electric lighting station. But the point is that if a movement can be inaugurated which will tend, by an interchange of ideas and of information, to make electric lighting more economical, more profitable, and more efficient, there will be a great increase in electric lighting, and the share of new orders falling to the lot of each manufacturing company will be larger than if no such movement had been started.

It is hoped that every electric lighting company in the United States and Canada will see that it is for its interest to send one or more delegates to Chicago, and it would be a favor to us if each company would send to us the name and address of the delegate it will send, as it may be desirable to communicate with them personally.

EDITORIAL NOTES.

The decision of the Philadelphia court in the Overland case has occasioned a good deal of rejoicing among telephone men that I have seen this week in and about New York. Somehow the impression got around among them that the thing was to a certain extent doubtful, and some of the "boys" had a blue spell for a day or two. Why this was I don't know. They had not seen the evidence, nor any report of the arguments, but it seemed to be in the air in some way. Hence the completeness of the decision was a pleasant surprise to them.

I forgot to say in my New England notes last week that, while in New Haven, Mr. Frost & Co. made a friendly call on Mr. Coy, representing the United States Telephone Company, operating under the McDonough patents. There were quite a number of the instruments set up in the office, and I talked over a line which ran to another station several blocks away. The talking was very good. The receiver is simply a magneto receiver—nothing more and nothing less. The magnet used is of the horse-shoe form. The transmitter is a carbon microphone. Its diaphragm is made of wood, measuring about four inches by six. In the instruments which I saw there were four Leclanché cells to each, although Mr. Coy said that one was enough for each. I did not learn that the company was doing any extensive business.

No less a surprise was the fact that the stock of the Bell Company did not show more of an advance, and, later in the week, that it did not hold the advance which it had made. But, after all, 250 is not a bad figure for a stock whose par is 100, and only those who did their clamming at high water have any reason to look upon it with disfavor. The company's income is sure to warrant fifteen dollars a year, besides a good lump added to surplus annually, and this means six per cent. per annum to those who hold the stock at 250. The erratic course of Bell telephone stock has tended to hurt it with investors. It is to be hoped that in future there will be no more "jerks." A steady advance, even though slow, based on increased earnings through a growth in output of instruments and a larger participation in the profits of licensees, is what holders of Bell telephone stock may reasonably look for and should hope for. Slow advance steadily held to is far better than spasmodic jumps.

The Mather Electric Light Company, of Hartford, Conn., which consists of Messrs. N. T. Pulsifer, H. G. Cheney and Robert Cheney, all of Manchester, Conn., famous in connection with the manufacture of American silks, have become the sole licensees of the Imperial Electric Company for the manufacture of electric lighting apparatus under the Perkins patents. Mr. Perkins has entered into a five years' contract with the Imperial Company, and will make his headquarters, for purposes of experiment and for so much supervision as may be needed, at the Mather Company's factory in Hartford. The Perkins lamp has the peculiarity of having several filaments, one or all of which may be used at once. In this way a large amount of light is got from one incandescent lamp. The dynamo used I have not seen, but it is said to be a marvel in the way of simplicity, lightness, and amount of current developed for the power consumed. The gentlemen composing the Mather Company have abundant capital and plenty of "push," and mean, I am told, to get at work at once. The Imperial Company will devote itself mainly to collecting its royalties monthly from the Mather Company, a department of of its work which I have reason to think will receive prompt attention on both sides. In the intervals it will sell apparatus manufactured by the Mather Company under its patents, special terms for this having been made a part of the contract which was signed last week.

The Daft motor folks are at work on the Brooklyn Bridge, putting in a third rail to carry their current to the motor. The return is expected to be through the whole bridge structure. The rail is of steel, and weighs fifty-six pounds to the yard. General Manager Hawksworth, of the Daft Company, in a recent interview, said: "This third rail which we will put down will be laid a little to one side of the cable, and will be used to carry the electric current to our motor. The return current, we expect, will go through the whole bridge structure. We calculate on having to surmount a grade of 200 feet to the mile, carrying from twenty to forty tons. To do this, our motor, which weighs from six to six and a half tons, will exert sixty horse-power. Fifty-five horse-power would be sufficient. We shall arrange so as to do all our switching by electricity, and will use both tracks. We will operate between the hours of one and four in the morning, the time when locomotives are not used on the bridge, and will draw the passenger cars then in place of the locomotives. This is a pioneer experiment with such heavy weights for an electric motor, but I have not the least doubt of success. We will prove that electricity is the cheapest, safest and swiftest of motive powers, and that it can perform the duties of the bridge railway far better than steam or cable." The exact time when this experimental use of electricity instead of cables on the bridge will be in actual operation cannot now be named, but it ought not to be many weeks now before its availability can be thoroughly tested.

The quietest telephone exchange I ever visited—and I have seen the inside workings of a great many—is that of the New York and New Jersey Telephone Company in Brooklyn, of which Mr. Sargent is the presiding genius. He is the general manager of the company, whose territory is extensive, but it is fair to say that this Brooklyn exchange is the apple of his eye. I remember remarking to a naval officer once, back in the war time, when some men had been called away to clean the decks, that the decks, to my eye, were clean already. "So they are," he answered. "They are not perceptibly dirty, but they may be imperceptibly dirty, and we wash them to keep them from becoming perceptibly so." Now, in Mr. Sargent's exchange, not only is there no perceptible noise, but, unless I am greatly mistaken, there is no *imperceptible* noise. When the young ladies talk to their transmitters—they never *try* to talk to subscribers—they don't even whisper, I doubt if they breathe. And let me call attention to the fact that the switch for the trunk lines to New York and beyond are in the same room. One gets the impression from the silence, which is so absolute that it is well-nigh painful, that there is nothing going on; but a glance at the board, and at the constant falling of drops—as noiseless as that of leaves in Valombrosa—shows that things are working lively. The secret of the whole thing is that every operator keeps her voice down, that custom and restraint have so habituated her to this that if she were to hear her own voice it would startle her as much as though she heard it in church; and the very excellent result is that her work is made easy and pleasant, without anything to rasp the nerves or confuse thought. Noise is an abomination at best, and any man who shows and proves that it can be avoided, whether in or out of a telephone exchange, is a public benefactor. Mr. Sargent deserves a monument.

I think I hear some of my readers—the manager, it may be, of some small exchange—say that it is easy for Mr. Sargent, with all the latest devices at his command, to accomplish these results. I saw no very late devices. He has the Western electric standard board, and his operators communicate with one another by telephone just as they do in a hundred other exchanges. No; the good results as to quiet grow out of *discipline*, and discipline is what nine exchanges out of ten in this country need more than new apparatus.

Mr. Sargent's operators use head telephones, some of them, and some of them wear the formidable-looking harness which enables them to have the hand telephone so fastened to a swivel on the shoulder that they can turn it to or from their ear by a motion of the head. This is more restful than having a head telephone pressed against the ear all the time, and is superior to having the instrument in a fixed holder, because it does not make it necessary to hold the head in a constrained position. At all events the operators prefer it, and they know best, for they have to use it.

The immediate and special object of my trip to Brooklyn was to see what was being done in the way of underground cables. I found that a good deal of work had been undertaken, and that much of it was nearly done. The plan is to construct an underground conduit of creosoted wooden planks, divided internally into six, eight or more lateral chambers, each chamber to carry one cable. In each chamber, at distances of about two feet, are little wooden rollers, whose office it is to facilitate the drawing in and out of cables. In this way they are putting in six cables of fifty conductors each (No. 20 copper wire) from the exchange, at 397 Fulton street, nine hundred feet to the junction of Washington street. There is also a similar conduit from the exchange across City Hall Park, about eight hundred feet, containing eight chambers. Each is to carry either a Patterson cable of fifty or one hundred wires, a Callender cable of 50 conductors, and an Okonite cable of twenty-five conductors. From this terminus a six-chambered conduit leads down Court street about fourteen hundred feet. This conduit will be partially filled at present, and the chambers left vacant for the present will be filled as occasion requires.

This idea of building a conduit of prepared plank, from which the cables can be withdrawn at pleasure, either for repair or to substitute others of different make or size, seems an excellent one, and worthy the attention of persons or companies who contemplate putting in cables. The roller idea is new, I believe. It is found to work well, and facilitates matters wonderfully. Many a cable has been seriously injured by rough usage in pulling through a pipe.

These cables terminate at the tops of high poles, where the conductors "fan" out, and, through a lightning arrester, connect directly with the overhead wires. The cables, therefore, are simply parts of the several trunk lines of conductors radiating from the exchange, and no service wires are taken from them directly.

While in the Brooklyn Exchange I listened to the "induction" in the trunk wire, which crosses the great bridge to New York. I am told that on the bridge, parallel with this wire, are several that belong to the Western Union, over which messages are sent by means of a dynamo current. From the sound I should say that the wire opened into a room filled with buzz saws and wood planers. It is a prolonged and painful note, sometimes rising to a shriek, sometimes falling to a wail, but never ceasing.

The talking between Brooklyn and New York, despite this noise, is quite distinct and clear. To Jersey City, after crossing the North River cables, it is by no means so good, and beyond that, from Brooklyn, talking is, to put it mildly, trying to the nerves. I am curious to know what it is going to be when an underground cable is used from the exchange to the bridge, a cable on the bridge, an underground cables across New York, and the present cables under the North River. If the Brooklyn operator can manage *that* without raising her voice, the day of marvels will surely have come.

I called on Col. Wm. H. Eckert of the Metropolitan Telephone Company, and found that the underground work in New York City, mentioned some time since in the REVIEW, was well under way. Before referring to it let me say that, despite hard times and the comparatively high rates charged in New York, the company has more subscribers to-day than ever before, and the number shows a slight gain each month. The figures now, all told, are 4,93 . It requires no small amount of work and tact to keep things so running, night and day, that any one of these can talk to any other one at any time he sees fit. To say that $150 per annum for such a privilege is an unreasonable charge is simply absurd.

The Metropolitan Company entered into contracts with three different parties to put in underground wires. The Western Electric Company is putting in its cables as follows: Two cables, of one hundred conductors each, from Seventh Avenue to Sixth Avenue, and from the corner of Sixth Avenue and Thirty-ninth street, where the exchange is located, up Sixth Avenue to Forty-fifth Street. Also one 100-conductor cable from the exchange to the south-west corner of Seventh Avenue and Thirty-ninth street. Also one cable of one hundred conductors, and another of fifty conductors from the exchange to a pole on Thirty-ninth street west of Seventh Avenue. There are also two cables of one hundred conductors each from the exchange to the north-west corner of Forty-second Street and Sixth Avenue, one of one hundred conductors to the north-east corner of the same, and one of one hundred conductors to the south-east corner of Forty-fifth Street and Sixth Avenue. This covers the Western Electric Company's contract. The cables are in wooden boxes, creosoted. I did not see them, but presume they are similar to the Brooklyn conduits.

The Brooks Cable, being put down, is of three hundred wires. It extends from the corner of Chrystie and Delancy Streets westward, across the Bowery into Spring Street, thence west on Spring Street to Mercer Street, and thence through Mercer Street to Canal Street. In this system, the wires, properly wound with cotton, are bunched into a cable, which is drawn into an iron pipe. Then a peculiar mineral oil is pumped in until the pipe is full, and it is kept full and under pressure by means of a supply of the oil in an elevated tank.

The Edison system is being put in in the vicinity of the exchange at the corner of Broadway and Twenty-first Street. A conduit carrying 250 wires extends from Sixth Avenue along Twenty-first Street to the exchange. One of 200 wires runs east from the exchange to Fourth Avenue. One of 100 wires extends from the exchange, north, on Broadway to Twenty-second Street; one of 100 wires from same point up Broadway to Twenty-third Street; and one of 150 wires from the exchange, south, along Broadway to the corner of Broadway and Nineteenth Street. As our readers know, the Edison system consists in carrying braided wires through an iron conduit, the wires bunched into groups, and these groups crossing over at intervals from one side of the conduit to the other, in order to break up the induction.

Now, if the reader will take down a good-sized map of New York, and lay down, in red ink, the cables which I have indicated, he will find that he has three spots on his map, each of which a good-sized wafer will cover. Now estimate how many such wafers it will take to cover the whole city, figure them at about ten thousand dollars each, and you will get an idea what it will cost to cover the city with a system of wires for telephone purposes alone. Try it, and see how encouraging it is.

Consolidation of the three electric lighting companies in Boston looks more and more probable. Each sent representatives to a meeting at the office of the American Electric and Illuminating Company last week. Mr. Robeson and Mr. Frank L. Higginson represented the Weston Company; Mr. Joseph Sawyer and Mr. Isaac Femro represented the Brush Company, and Mr. E. H. Goff and Mr. Silas Gurney the Merchants' Company. A year ago it would have been impossible to get these gentlemen to meet even. They discussed matters, decided that combination was better than competition, that they meant business this time, and appointed a committee of three experts to set a value on the three properties, in order to get at a basis for consolidation. A good deal has been said about the difficulty of getting at a true and equitable basis, but the thing is easy enough when everybody means business.

The application made by J. W. Converse and others for the appointment of a receiver for the American Rapid Telegraph Company, and for an injunction restraining the Bankers and Merchants' Telegraph Company from interfering with its property, has been denied by Judge Wallace in the United States Circuit Court.

It is claimed that a mechanical contrivance for dispatch and safety in the running of railway trains is the "locophone," which has been constructed by Frank B. Taylor, and is now being tested on the New York and New Haven road. It is an apparatus resembling the telephone, designed to place each engineer on the road, while the trains are moving at the highest speed, in instantaneous speaking communication with the superintendent or train dispatchers. All the engineers on the road receive the message at the same moment. The circuit is made over the rails.

Under the excellent management of Mr. Jesse Bunnell and Mr. Charles McLaughlin, there has grown up within the past few years, in this city, one of the largest establishments for the manufacturing of telegraph instruments and supplies to be found in the country. More than a year ago their business had attained such large proportions they were obliged to rent a new building specially designed for manufacturing purposes of this nature, where they have since employed upwards of 130 men on full time. In addition to their extended trade in the electric light and telephone field, they have furnished the largest part of the instruments used by the Western Union, Bankers and Merchants', and other telegraph companies. On the first of this month Messrs. Bunnell & Co., opened at 106 and 108 Liberty Street, a large wareroom and store, elegantly fitted up for the display of the electrical apparatus and supplies manufactured by them, which will be found of special interest to those in this field to visit.

It has been demonstrated experimentally that one thousand feet of gas, burned in any ordinary burner, will give less light than will be given by incandescent lights operated from a dynamo driven by a gas engine in which the same amount of gas is consumed. To put it in another way, 1,000 feet of gas at $3.00 per thousand feet gave, when used in a gas engine, enough more light to bring the light down to a comparative cost of $2.80 per thousand feet. This being the case, considering the superiority of the electric light in many well-known ways, it is strange that more gas engines are not used in this country for isolated incandescent plants. Doubtless, steam has advantages, and for large plants is preferable, but gas is found to work admirably in England, and is used by many private establishment, both dwellings and business houses, where the use of steam, with the attendant cost of an engineer and fireman, would be wholly out of the question. Electricity has dealt a telling blow, not so much at the price of gas stocks as at the price of gas. It would be no more than fair now to turn round and give the gas companies a lift by using their product to produce the power for making electric lights. It is clean and safe, and demands a minimum of attention. Indeed a good gas engine will run right along and need no more watching and less handling than a heating furnace ought to have. It is a wonder that more of our stores do not look into this, and get a better, safer, and more desirable light than they now have without material increase in expense.

Telephonic News

*** Buffalo has discarded the "name" system, and now uses numbers exclusively.

*** The new microphone invented by M. Hipp, of Neufchatel, is being tried at the Mariemont Colliery, Belgium, for signaling between the surface and the underground workings.

*** The Societa Generale Italiana dei Telefoni has, with the co-operation of Commendatore Floro, of the Rubattino Florio Company, constituted a local telephone company, the chairmanship of which has been offered to Sig. Florio.

*** One of the most practical and complete gas burners for everyday use that we have yet seen on the market, is one recently brought out by A. M. Young, of Waterbury, a description of which may be found in our advertising columns. The device is for turning on the gas and lighting it, all by the action of the electric current.

*** M. A. Berthon, chief engineer of the technical service to the Societe Generale des Telephones, France, has been appointed engineer-director of the construction and working department. The *Bulletin* says that M. Berthon, past president of the Societe Amicale des Eleves de l'Ecole Centrale, is the the first engineer to make a practical application in France of the Edison telephones.

*** The stockholders of the Washington and Union Telephone Company held a meeting at the Bank of Washington, Mo., last week, when the following directors were elected for the ensuing year: L. Wattenberg, G. D. Barnes, O. H. Guenther, W. F. Reinhard and A. J. Seay. This company has been in existence now for two years, operating between Washington and Union, the latter the county seat of Franklin county, and has paid the stockholders handsomely under its very efficient management. The capital stock is $1,000, all paid up, and a dividend of 10 per cent. per share was declared as the net earnings of the company.

*** At the annual meeting of the stockholders of the Bell Telephone Company of Buffalo, held at their office, 348 Main Street, for the purpose of electing a Board of Directors for the coming year, the following board was unanimously chosen, 3,776 shares of stock being voted upon: Joseph Churchyard, Edward J. Hall, James McCredie, Harlow C. Palmer, James W. Tillinghast, Henry M. Watson, Samuel H. Cowles, Edward J. Hall, Jr, A. O. Morgan, Sherman S. Rogers, Theo N. Vail, Wm. H. Watson, John L. Williams. At a meeting of the above board, held January 12, the following officers were elected for the ensuing year: President, Henry M. Watson; Vice-President, James McCredie; Secretary and Treasurer, Harlow C. Palmer; General Manager, Samuel H. Cowles.

*** The treasurer's statement of the Tropical American Telephone Company, Limited, of Boston, Mass., on January 7, 1885, shows the following:

ASSETS:

Cash on hand in bank	$24,011.93
Due in cash from sub-companies	17,109.37
Notes receivable, due March 15	4,229.55
Total	$45,350.85

DEBTS:

Due for instruments and supplies	$10,879 98
Due to sub-companies	657.40
Notes payable { $4,028 62 Feb. 15 / 5,000.00 Mar. 21	9,028 62
	$20,566 00
Assets in excess of debt	24,784.85
	$45,350.85

No account is made of sub-company stocks, sub-company contracts, patents and other rights, or supplies on hand, office furniture, Trinidad, W. I., exchange of 140 subscribers, or other assets of uncertain value.

*** The November statement of the New England Telephone Company shows that the gross earnings for the month were $76,737.43; the operating expenses $55,774.58 (a decrease of about $7,000 as compared with October), and the net income $20,962.85, or about $2,000 more than for October. The construction expenditures were $22,746.85 *vs.* $1,784 more than the net receipts. The lines are now all in most excellent shape, and for several months to come the construction expenses will be much lighter than of late. For the first time in its history the company shows a loss in subscribers for November, the number of instruments put in being 350, and the number taken out 372, making a net loss of 22. This was due principally to the removal of telephones at various summer hotels, which had been put in for the season only. The report of the instruments for December shows a gain of about 20, with one exchange yet to hear from. The aggregate number of instruments now in use is 17,831. The general financial report for December will be very much better than for either November or October.

*** The Mexican Telephone Company has 738 sets of instruments in use in Mexico City and suburbs and in Guadalajara, and will forward 300 additional sets within a few weeks. It is earning gross something over $3,000 per month, and from $10,000 to $12,000 net, which latter amount is needed to buy supplies and for construction. The company has no debt in Mexico, and only a nominal one of $4,000 or $5,000 in the United States. If supplies were counted as cash, the company would show a surplus of, say, $10,000. It is contemplated to build new lines into some of the cities between Mexico City and Guadalajara, and there is a good demand for telephone service by the haciendas. The company is doing a business satisfactory to its managers. The sub-companies are generally doing well. The Chihuahua and Durango companies, which are under one management, have ordered 100 sets of instruments. These companies have no debt, and show a small surplus. The Pacific Coast Company has been petitioned into insolvency in Mexico by direction of the Mexican Company. There is some hope of a dividend on the stock of the parent company in 1885, but it is hardly strong enough at present to bank upon.

*** The Brighton and Hove Exchanges have nearly doubled the number of subscribers. Direct wires have been run between London and Brighton. These are nearly free from inductive effects, and the articulation all that can be desired. The wires are run along the main line of the South Eastern Railway cross fashion. Business has also been commenced at Eastbourne and Hastings, and exchanges will be opened early in 1885; in fact, several private wires are already at work. It will be necessary, for the due development of telephony, that a much better class of trained engineers be employed, as the constant train of delays and complaints must militate against the enormous development which should await it, and it is much to be feared that the public will have to wait until the present monopoly is abolished; and as Nature's law seems progress, it is useless to suppose that everything is known at present.

*** The King of Portugal has just conferred the honor of Cavalliero do Christo on Mr. Alan Danvers, engineer and manager to the Edison Gower-Bell Telephone Company at Lisbon. Mr. Danvers has received this distinction in consequence of the following interesting circumstances: Some little time ago the King of Portugal was prevented from attending the first performance of the opera "Lauriana" through the death of the Princess of Saxony; and neither the King nor the other members of the Royal family would have heard anything of the opera, had not Mr. Danvers come to the rescue and suggested that he should telephone the opera from the house to the Ajuda Palace. The King, delighted at the proposal, immediately acquiesced. The result proved most satisfactory, as both the music and the words are stated to have been perfectly distinguishable; and the King shows his appreciation of the fact by conferring this honor of knighthood on Mr. Danvers.

*** Says the Philadelphia *Times* of Jan. 15: "The gentlemen interested in the American Telegraph and Telephone Company received word last week from Harrisburg that the charter they applied for some time ago had been duly granted. This company purposes to run lines from Philadelphia to Easton and Pittsburg, and ultimately to extend its operations to all the principal cities and town of the State. The incorporators are Messrs. J. E. Kingsley, Samuel B. Huey, Josiah R. Adams and F. E. Buchler, of Philadelphia, and Thomas B. Doolittle, of Boston. Mr. Kingsley said last evening: 'We intend to operate under the Bell system, which has been in operation a year or more between New York and Boston, and within six months we hope to connect Philadelphia with Pittsburgh and Easton by telephone. There is no question in our minds as to the practicability of the system, for it has been shown by experiments that sound can be transmitted much longer distances than those that will be covered by the lines we purpose to run. As to the capital of the company we are not yet prepared to speak, but you can depend upon it that it will be forthcoming when required.'"

*** The Commissioner of Patents has rendered an important decision in the matter of the petition filed in behalf of the inventor, Edison, to determine definitely the status of the interference heretofore declared between himself and Blake and Drawbaugh, the subject matter of the interference being the combination in a telephone of a metallic diaphragm and an elastic pad or muffler. In this case the Secretary of the Interior overruled the decision of Commissioner Marble, and restored Edison to the position in interference from which he had been deposed by that decision. The action of Drawbaugh's counsel raised a question as to the scope of the decision of the Supreme Court in the case of the Commissioner of Patents against the United States *ex rel.* Hoe & Co., where it was held that the Secretary had no legal authority to revise the decisions of the Commissioner of Patents. Drawbaugh's counsel desired that the decision of the Secretary of the Interior, in which the decision of Commissioner Marble was reversed, and the interference between Drawbaugh and Blake continued, should be treated as a nullity; that the decision of the Commissioner should be allowed to stand as the judgment of the office, and that the interference between Drawbaugh and Edison should stand dissolved. The Commissioner decides that he cannot reopen the case and that the decision of the Secretary will be treated as if rendered by the Commissioner.

*** Judge Butler, in the United States Circuit Court, in Philadelphia, last week, granted to the American Bell Telephone Company a preliminary injunction restraining the Penn Overland Company, of Pennsylvania, from using a transmitter and receiver in telephones claimed to be an infringement of the Bell patent. This motion was originally made a year ago, but owing to a similar suit then pending in New York, no decision was given. Recently, however, the New York case was decided in favor of the Bell patent, and the motion for the preliminary injunction was again called up before Judges Nixon, of New Jersey, and Butler several days ago. A reargument was had upon the ground of the introduction of new matter, but counsel were limited to a day's hearing. Judge Nixon, of New Jersey, heard the case, together with Judge Butler, because of a case existing in the New Jersey courts, and which was argued for the sake of convenience together with the Pennsylvania case.

Judge Butler delivered his opinion orally and said: "In the case argued a few days ago, involving the Bell Telephone patent, the court is prepared to dispose of the motion for a preliminary injunction, but does not esteem it necessary to file a written opinion. When the motion was called up for argument last spring the case was fully heard and counsel were listened to at great length for some three days. Upon consideration of the evidence before us and the arguments of counsel, the court was of the judgment that everything of essential importance was embraced in the case between this same plaintiff and the several defendants with whom he contested the validity of his patent, except the claim here set up that Drawbaugh had anticipated Bell. Inasmuch as that question was involved in a case then pending in the Circuit Court of New York, which was ready or nearly ready for final hearing, the court esteemed it unwise to dispose of that important question of fact upon exparte affidavits before us. The motion was laid over, therefore, to afford the parties an opportunity of having this question (the claim on behalf of Drawbaugh) settled in that case, where, from the character of the proof, it could be done with much greater prospect of doing justice to the parties. Had it not been for the introduction of this question into the case, the court would have granted this motion at that time.

It was not for the court to say whether the conclusions reached in the former cases alluded to were sound, or otherwise. Proper regard for the courtesy due from one circuit to another, as well as for the importance of harmony in the decisions of the respective circuits, required that he should treat these decisions as conclusive until reversed by the court of last resort.

Upon the case in the Circuit Court of New York being disposed of, this motion was again called up. Counsel for respondents asked to be heard on the ground that new matter had been introduced since the former argument. The court esteemed this a reasonable request, and counsel were heard. Upon full consideration of the alleged new matter and the arguments of counsel, urged with great zeal and great ability on behalf of respondent, it is the judgment of the court that part of the new matter was involved in the former cases, and that to the extent that it was not so involved all of it of material significance was within the convenient reach, and, it is safe to believe, within the knowledge of some, if not all, the numerous counsel employed in these cases, and it was not introduced and pressed simply because it was esteemed less available—of less importance for the purposes of defence than the matters which were introduced, pressed and passed upon.

Upon full and patient examination of everything submitted to us, we believe that the alleged new matter is but the refuse and dregs of the former cases, if I might be allowed the use of so homely an illustration, I would say, but the heel taps found in the glasses at the end of the frolic.

The motion is therefore allowed.

Judge Nixon disposed of his case at Trenton by granting a similar motion for an injunction.

Canadian Telegraphy.

The shareholders in the Montreal and the Dominion Telegraph Companies will act wisely by noting "the signs of the times," so far at all events as they affect their prospective "guaranteed dividends" by the Western Union Telegraph Company, in conjunction with the avowed determination of the Canadian Pacific Railway Company to compete at an early date for the commercial business at Canada. Although the Western Union Telegraph has been until lately a 7 per cent. dividend-paying company, its last payment was at the rate of 6 per cent. per annum only, and its $100 paid-up shares are today quoted at 55 only. But since the first day of the present year the Baltimore and Ohio Telegraph Company has added no less than twenty-eight thousand (28,000) miles of new telegraph lines to its system. It has, besides, cut down tariff rates permanently to such an extent (15 cents for 10 words, for instance, between New York and Chicago,

1,020 miles distant), that the monopoly hitherto enjoyed by the Western Union throughout the United States is now and for ever "a thing of the past." Neither is it in any degree probable that existing Canadian lines will long be free from some similar competition. Such competition could duplicate the system throughout the land with new poles, plus all modern improvements, for less than one half the present face-value of the $3,200,000 share capital of the Montreal and the Dominion Telegraph Companies. To this sum has now to be added the expenditure by the Great North-Western Telegraph Company, itself a close corporation under the immediate control of the Western Union Company, a corporation not only alien but essentially hostile. Again and again has the shareholders urged upon the Dominion Government the advisability of securing the absolute control of the entire telegraphic system of Canada, the same as with the postal communications of the land. The choice seems to lie between the purchase of existing lines at a fair valuation upon stock quotations, or the erection, at the national expense, of an entirely separate and independent system, in either case accompained by a considerable reduction of present rates. A reduction to 10 cents for ten words throughout the Dominion has been suggested by practical men whose experience should not be lightly rejected, but these and other matters of detail can only be ultimately decided on after the most careful consideration. At present the shares of the Montreal and the Dominion Telegraph Companies are quoted at 113½ and 80 respectively, under guaranteed lease dividends of 8 per cent. and 6 per cent. respectively. A clause in the existing contract, however, makes such guarantee terminable at twelve months' notice. Canadian competition in some shape, either national or by means of private enterprise, may safely be accepted as a more or less impending certainty—a fact the financial consequences of which in their own interests those concerned in the present arrangements would be blind indeed not to take into most anxious consideration. We now renew our persistent and repeated advocacy, equally in the interest of the shareholders in our Canadian companies and of the public, that the Dominion Government should without avoidable delay assume possession of the entire telegraphic system of Canada under some equitable agreement or erect its own lines.

The Kinetic Engineering Company's Cables.

The following are the results of the insulation tests made on the cables laid in accordance with the Greenock Provisional Order, before leaving the factory: It was specified that the cables should have an insulation resistance of not less than 1,000 megohms per mile at ordinary temperature. The actual results obtained, when tested under water, were 1,925 meters of cable of one strand of 1.2 millimeters diameter, gave 25,000 megohms per kilometer; 457 meters of cable of 36 strands of 1.5 millimeters diameter, 5,800 megohms per kilometer; 465 meters of cable of 36 strands of 1.5 millimeters diameter, 6,500 megohms per kilometer; 582 meters of cable of 12 strands of 1.6 millimeters diameter, 12,500 megohms per kilometer; 584 meters of cables of 12 strands of 1.6 millimeters diameter, 12,500 megohms per kilometer. The insulation given is, therefore, from 3½ to 16½ times better than was required. The Imperial Austrian Telegraph Department has just laid down in the Arlberg Tunnel seven miles of the No. 25 cable, consisting of three conductors, each of seven strands of No. 22 B.W.G. After the laying of the cable it was tested, and found to give an insulation of 7,000 to 8,000 megohms per kilometer for each conductor. The cable was delivered in lengths of 1,000 meters, so that there were ten joints. Tests were made after jointing and laying of each length, and it was found that the insulation resistance per kilometer remained the same after each joint. Since then a further order has been received from the Austrian Government for six and a quarter miles of No. 3 cable, consisting of one conductor of seven strands of half a millimeter diameter. This particular cable is largely used by the French Ministry of War.

.... Under the resolution of the Legislature of 1884, a hearing was given upon "the subject of the occupation of railroad locations by more than one company organized for the purpose of transmitting intelligence by electricity." Counsel for the Baltimore and Ohio Telegraph Company alone appeared in favor of legislation. Various railroad companies appeared in opposition. The commissioners treated the subject at considerable length, the main conclusions being as follows:

There is no serious question as to the power of the General Court to act upon this subject. Legislative authority over the railroad charters of Massachusetts is almost unlimited. Nothing is suggested as to any of these charters which forbids the legislation proposed. But the power to pass an act does not necessarily prove its wisdom or require its passage. All things which are lawful under the constitution are not expedient. Authority to create a new danger for all travelers does not necessarily imply a duty to exercise that authority. The general right of imposing a new use upon land devoted to corporation for a public purpose is precisely the same with the right to take any other land, neither greater nor less. It depends upon public exigency and upon a gain and loss to the public in so doing. In considering the proposed advantage of constructing and operating telegraphic lines on a railroad track, we should remember that the public, while it must lose something in safety, may gain nothing in convenience or in cheapness unless it is secured by legislation. It needs no testimony to show that the erection of poles is a source of danger on a track. It is asked, If one line is permitted, why not more? Simply because two obstructions on a road are more dangerous than one; and danger increases in more than arithmetical proportion with the increase of obstacles to vision. Or if an additional number of wires be used on each pole, then the danger of falling, especially when loaded with snow or ice, is increased. The number of poles on every road should be reduced to a minimum. It is now proposed to increase the number indefinitely. The conclusion which the board has reached is that it is very desirable that all telegraphic wires on railroad routes should be laid underground; but, owing to the expense and to the difficulty of operating and keeping them in repair, this is impracticable now on long routes, although we incline to believe that it can and should be done in the streets in cities. It may be that at some future time the way will be clear for compulsory legislation, forcing all telegraphic wires on railroads to be so laid; but it would be wrong and foolish to order this now, when so many hopeful experiments as to insulation and other improvements are in progress, and when so much remains to be learned as to methods. If it is asked how the monopoly made possible by this exclusive use of tracks by one company is to be avoided, the answer is: No monopoly exists. There are in operation to-day four companies competing between New York and Boston. No monopoly ever existed arising from the privilege of using railroad locations. The highways of the State furnish, under the law, avenues for telegraphic communication. If monopoly ever existed, it is not because the entrance of rivals has been forbidden, but because they have sold out to the strongest company. If serious evils are felt arising from the limited number of telegraphic companies, it would be well to remember that unlimited competition is not the only cure for these evils, but that State control may be applied as a remedy. Having regard to the safety of the traveling public, the commissioners decidedly decline to recommend any general law allowing the compulsory occupation of railroad locations for telegraphic purposes.

.... The first line of pneumatic tubing was laid in the French capital as far back as the year 1867, and on January 1, 1878, there was 20.5 miles of tube length, an average of 8,830 feet laid per year. The total length at present is 111 miles, not including 12.5 miles that secure communications with the centers of power. It includes a double main line, in which terminates 72 secondary ones, with various branches, plus a direct line between the central station and the Bourse.

Eight stations, with horse-power total of 315 horses and four auxiliary water-motors, supply the 111 miles of tubing. The trains run every three minutes upon the direct line from the central station to the Bourse, every five minutes upon the principal lines, and every quarter of an hour only upon the few branches.

The tubes are 2½ inches internal diameter, bored perfectly true, with not the slightest projection to interfere with the running of the box or "traveler," as it is driven through by pressure of the compressed air. After the dispatches have been put into the box the latter is closed by means of a rubber sheath which almost entirely covers it. The last box of each train carries at its back a sort of collar formed of a flexible leather ring 3¼ inches in diameter, whose edges, being in contact with the inner surface of the tube, obstruct the latter completely without interfering with the movement of the box. The box thus arranged is called the piston box, and performs the part that a locomotive does on railways, while the simple boxes correspond to cars. Each box is capable of containing twenty dispatches.

.... By an arrangement made between the French Minister of Posts and Telegraphs and the Societe Generale des Telephones, subscribers to the Paris Telephone Exchange will, in a short time, be able to despatch and receive their telegraphic messages by telephone, a telephone service, to be available day and night, now being in course of organization at the Central Telegraph Office. Such telegrams will not be charged extra; but the telephone subscribers must pay an additional 50f. per annum. M. Van Rysselberghe, of long-distance telephony fame, has had an interview with M. Cochery, the French Postmaster-General, with reference to telephonic communication between Rouen and Havre, in the telegraph offices of which towns the necessary arrangements are already in progress.

.... The actions brought by the City of Philadelphia against the Western Union Telegraph Company, the Mutual Union Telegraph Company, and the Bell Telephone Company, for the amounts alleged to be due as license fees under the ordinances of January 6, 1881, and March 30, 1883, have been reported upon by the referee to whom they were submitted. After a lengthy review of the case, the referee says that because the license fees exacted are unreasonable as fees, and because they operate in substance as a tax, he is of the opinion that the ordinances cannot be enforced, and that the finding in each of these cases should be for the defendants, and he accordingly so finds.

.... The Portuguese telegraph staff are making telephonic experiments under the direction of Mr. Van Reysselberghe. The department of Posts and Telegraphs, at Lisbon, has addressed numerous invitations to the press and to members of the scientific world, for a conference followed by experiments, on the system of simultaneous telegraphy and telephony on the same wires The experiments have been carried on over a short line between Lisbon and Cintra, a small town situated at a few kilometers from the capital.—*La Lumiere Electrique.*

.... The Commercial Telegram Company, of New York, has won the suit brought against it by the Gold & Stock Telegraph Company for alleged infringement of patents. The Financial Telegram Company is the Boston company to operate under the Commercial Telegram Company's patent.

.... If the present fight between the Baltimore & Ohio Telegraph Company and the Western Union continues, the public will enjoy the use of their lines at reasonable rates. The only reduction made so far by the Western Union is on the Mutual Union lines.

TELEGRAPHIC

.... The Society of Telegraph Engineers and Electricians, founded in London, in 1871, under the name of the Society of Telegraph Engineers has to day 1,256 members, of whom 369 are active, 179 are foreign, 668 are associates, 37 students, and 3 honorary.

... M. Cochery, the French Minister of Posts and Telegraphs, has recently presided over experiments at Troyes, with the Government and railway engineers, with a view to the automatic taking up and deposit of dispatches from railway trains.

.... The London *Times*, in its *resume* of "Business in 1884," mentions, as a noteworthy fact, that in August a telegraph station was opened at Pekin, the capital of the Celestial Empire having until the past year been kept free from the presence of the electric wire.

.... The French Government has contracted for the laying of a cable from Zanzibar to Mayotte, Nossi-Be, St. Mary and Tamatave. The laying of the cable should be completed during the month of June next and its continuation to Reunion and the Isle of St. Maurice will be carried on by a company.

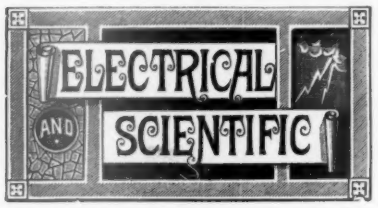
.... A telegraph operator at Prescott, Ari., successfully wooed a young lady living at Vevay, Ind., but her parents objected to the match. Lately it leaked out that they had made the circuit, as it were, by means of electricity, a clergyman was had, asked the necessary questions by telegraph and pronounced them man and wife.

.... For a year past a project has been on foot to establish direct telegraphic communication between the diverse great commercial centers. Havre is already connected with Antwerp and Hamburgh, and it is now desired to connect Paris with Manchester, and Havre with Liverpool, but the project meets with constant opposition from England.

The engineer in charge of the laying of the sub-marine cable from Santa Cruz in Teneriffe to Senegal, has sent the Minister of Posts and Telegraphs a telegram announcing that the work is finished, and that Senegal is now in communication with Europe via Teneriffe and Cadiz. We are also able to announce that Senegal will soon enter into the international telegraphic union.

.... The Austrian Telegraph Administration has proofs that a great number of private persons have installed telegraph and telephone lines without the necessary authority from Minister of Commerce. The authorities have in consequence received orders to suppress all of these lines, until such time as the proprietors shall place themselves under the rule in relation to the minister, by making application for official authorization, and by conforming to the conditions imposed by the law.—*La Lumiere Electrique.*

.... The evident indisposition of the Commercial Cable Company to at present further reduce rates has developed a rather strong market in Anglo-American shares. It is stated that the new company's lines are overstocked with matter, but that the bulk of their work consists in the transmission of news dispatches. The pooled companies hope that this condition of affairs will continue, and state that if the Mackay-Bennett people load up their lines with press messages, private business which is by far the most profitable, must inevitably suffer. These reports are undoubtedly circulated with a view to securing customers away from the concern, and probably have no foundation, in fact, as the Commercial Company break the messages of firms and individuals in the usual manner, giving them precedence over news, for the simple reason that they pay better and cost no more to transmit. We wish the Commercial Company the fullest measure of success, and we think Mr. Ward knows how to reach it.



* * We learn from the *Rivista dell' Elettricita* that these accumulators have been used in connection with Gaulard and Gibbs' secondary generators, by which the transformation may be effected, not only from series to quantity, but also from quantity to series.

* * A correspondent to the *Bulletin* of the Compagnie Internationale des Telephones states that existing boiler scale may be detached by keeping the poles of a 10 or 12 cell Bunsen battery connected with the ends of the boiler for 30 or 40 hours, and that afterwards the plates may be kept clean by a weaker current similarly applied.

* * Every committee room of the Senate has been supplied with an electric bell, which is rung by a touch upon a button in the Senate chamber. The sound of the bell at any time during the sessions of the Senate will be a summons to Senators in the committee rooms to appear in the Senate chamber. Under the old plan, when a roll-call came up, or any business demanded the presence of the Senators, pages had to be sent in search of those not in the chamber. Now, by a touch a ringing summons will be sounded in the committee rooms, restaurant and marble room, which will notify Senators that they are wanted in the chamber. When Mr. Clay was Speaker of the House he had bells arranged for the same purpose, but as electricity was not then known as such a useful agent the bells were rung by pulling a wire in the halls of the House.

* * While experimenting and studying the march of French soldiers, M. Marcy has demonstrated that low heels have a favorable influence on the pace which a person walks, and that the rhythm of the step has an important influence on the speed. The rhythm was studied by means of an electric bell, actuated by a pendulum of variable length to enable the subject to keep exact time, and the distance traveled was recorded on the odograph by electric signals sent along a wire every 50 meters traversed. It was found that the length of the step increases little until 65 steps per minute are taken; it then increases until 75, and afterwards decreases as a higher rhythm is reached. The speed of travel increases with the acceleration of the rhythm up to 85 steps per minute, and decreases at higher rhythms.

* * A farmer from Iowa, traveling towards Chicago, was inquiring for the address of an electrical manufacturing concern in the city, says the *Chicago Herald*. "The fact is," he said, "I am an inventor. Have struck a big thing, and am going down to Chicago to have it developed."

"Electric light?"

"No."

"Telephone?"

"No, none of them things. My invention is agricultural, and will be a blessing to every farmer in the Northwest. You see, years ago, when we had no fences on our farms, our hired men had no place to sit down and rest, there bein' no stuns or stumps. When the wire fences come into style we chuckled to ourselves, and said the barbs on 'em was good not only to keep stock from scratchin' or rubbin' of 'em down, but to keep the hired men off. Well, the hired men have beat that all to pieces. They sew leather strips on their pants, and seem to delight in sitting on the barb wire every time they come to the end of a row or furrow. They think they're so smart, you know. Now, I calculate that the farmers of the Northwest lose $700,000 every summer and fall by hired men wastin' time sittin' on the fence. But I've fixed 'em—my new invention will stop that."

"New kind of barb on the wire?"

"Naw. There hain't no kind of barb wire on earth that a hired man won't contrive to sit down on at least two hours a day. Just wait till next spring, when I connect my ten horse-power electric battery with the wires on my fences. Won't it be fun? The wires will look nice and inviting, as usual, but about two seconds after the hired man has sat down, you'll see him jumpin' clean over the mules in his anxiety to get back to the plough. Whoop, but won't it be fun! County rights for sale."

Electricity Man's Slave.

THE TELEGRAPH, THE TELEPHONE, THE ELECTRIC LIGHT AND THE ELECTRIC MOTOR.

BY THOMAS A. EDISON.

Among the many factors which have developed commerce and industry and stimulated all the forces of progress during the last half century, none has played a part so radical and essential as electricity. Hardly a single nerve or fiber of that complex body which we call society, that has not thrilled and vibrated with its influence. It has strengthened the bonds of international amity; it has quickened all the methods of trade and lent ten fold precision and celerity to the innumerable agencies by which it works; it has breathed new vitality into the arts and sciences; it has even warmed and strengthened the social forces; and in a word one may justly claim for it such a universal stimulus, as cannot be credited to any other purely physical agency in the world's history.

It is not yet fifty years since the invention of the electro-magnetic telegraph, made by Professor S. F. B. Morse, was first put into operation between Washington and Baltimore. To-day there is hardly a hamlet so small and remote that a telegraph station does not link its inhabitants with every point of the civilized world. The crude apparatus first used by Professor Morse has been again and again improved on by subsequent inventors in the same field.

Only a few years elapsed after the success of Professor Morse before the first submarine cable operated in America was laid between Cape Ray and the shores of New-Brunswick. This achievement in 1852 suggested to Mr. Cyrus W. Field, we believe, the connection of the New World with the Old, by means of a submarine cable. The history of the first Atlantic cable laid; the jubilee over its triumphant completion on August 6, 1857; its short life of less than a month; the pluck and energy displayed by capitalists in their endeavors to lay a second cable nine years later; the failure of this second effort; the ultimate success attained by the laying of the Anglo-American Telegraph Company's; and its final opening as a medium of public trafic on August 26, 1866—all these things are sufficiently well known to most of our readers.

Closely connected with the development of the telegraph came the invention of the speaking telephone, this being the logical consequence of the former. When it was once found possible to transmit signals over a length of wire by means of the electrical fluid, it was certain that sooner or later experiments would be made ultimately with a view to employing the same agent as a means of transmitting articulate speech to a long distance. These experiments reached a successful conclusion in 1876-'77 by the invention of the magneto receiving telephone of Professor Alexander Graham Bell, and the the carbon transmitting telephone of the writer of this article. Many others have laid claim to the invention of the telephone, or to so-called improvements on the original devices.

* * * * * * *

Coincident with the development of the speaking telephone, the electric light was first brought to a practical success by the illumination of the Avenue de l'Opera in Paris by the Jablochoff candle in 1878. Prior to this but little had been done in the way of electric illumination on an extended scale. The exhibition made in Paris gave a great impetus to lighting as a business. From that time to the present the progress has been marvelous and rapid, only second to that of the telephone.

Many inventors, among them Staite, King, Kossloff, and Sawyer, had previously been experimenting with a view to making useful lamps giving light by means of incandescence But these experiments had been based on fallacious theories and were foredoomed to failure. The writer was led to the invention of the filament lamp by keeping in mind the commercial necessities of the case as applied to a lamp forming but one unit of a complete system. His object, therefore, was not merely the device of an electric lamp; he aimed to invent a system of electrical illumination which could be operated on an extended scale in the same manner as is the business of gas illumination; to find some means by which the electrical energy could be turned into light, and that light be used for household purposes and sold by meter-records—in short, a system superior to that of gas and able to compete with it commercially. The final result of these experiments was the invention of a complete incandescent system, and the starting of a Central Station in New York, at 3 P.M. on September 4, 1882. Then for the first time electricity for the production of light was supplied and sold on a meter. This station has been in operation since, night and day, and has been followed by the establishment of other stations both in this country and Europe.

In addition to the foregoing, electricity has been brought to the aid of metal-workers for the purposes of electro-plating and electro-typing; it has assumed a place in our houses for the operation of call-bells and annunciators; for protection against burglars; and for the correction of our clocks and other purposes.

Yet though so much has been already done in the last fifty years in the way of electrical development, the writer is confident that far greater progress will be made in the future. We stand to-day only on the threshold of its tremendous probabilities. The uses to which the electrical energy can be adapted are so numerous that the present generation hardly dreams of them. Nothing of any startling character can be expected of the electrical telegraph. The business has been so long established, the improvements are so numerous; that very little remains to be done. Some day there will be, no doubt, a sextuplex system, which will make one wire do the work of six. While none so far tried has succeeded commercially, the expanding magnitude of telegraphy makes it a necessity. This will enable the present telegraphic plant to do more work, and lessen the investment necessary for the instalment of any future plant. The necessity for economic running expenses must lead to the use of a system of autographic telegraphy, which will enable the telegraph companies to dispense with most of their skilled labor.

The development of the telephone is in its very infancy. In the first instance, those in the center of cities alone had the advantage of telephone service; then the suburbs were reached, and later on towns adjacent. The business has reached such magnitude that it has outgrown the present equipment. The company controlling the telephone business in this country fully recognizes this, and is working with all the talent which money and interest can obtain to improve the service. The result will be greatly to the advantage of the public, and consequently to the commercial development of the telephone.

The efforts made with a view to long-distance telephoning have already proved quite satisfactory in a commercial way and promise excellent results. Conversation has been conducted between Cleveland and New York, and is now daily carried on between New York and Boston to a limited extent. The great difficulty in long-distance telephoning is the loss of the current by static induction on the earth and wires in close proximity. If a single wire could be placed sufficiently high as to amply clear all the mountain tops, one would whisper around the world with perfect ease; or if a wire could be stretched from the earth to the moon, the connection could also be adequate. Perfect results were recently obtained on a Government line in Arizona, a distance of about a thousand miles, the wire stretching over a treeless space of country, more perfect far than can now be had between New York and Hartford. The loss of the electrical energy by static absorption and the running together of the electrical waves, is the fact that utterly precludes the possibility of sub-marine telephoning across the ocean. One thing, however, is now certain, that the time is close at hand when the telephone will be perfectly successful in an unbroken circuit for a distance of at least 300 miles; and that a subscriber will be able to communicate with 75,000 commercial houses. More than this, even, it is probable that by means of repeating stations, communication can be had over all parts of the United States.

The changes wrought by the telegraph and telephone will be equaled, if not eclipsed, by the transformation wrought through electrical lighting. Two years' experience proves beyond a doubt that the electric light for household purposes can be produced and sold in competition with gas.

It is immaterial whether the electric energy is used for light or for other purposes. It is so easy of control, the apparatus required so inexpensive, that it can be used as a motor-power for purposes innumerable. In a house it can be utilized to drive miniature fans for cooling purposes, to operate a sewing machine, to pump water, to work a dumb-waiter or an elevator, and for a hundred other domestic uses which now require personal labor. In places where small steam engines are used at great expense, owing to the special attendance requisite, the electric motor will be invaluable. Electricity as a lighting agent has the great advantage over gas that it can be used at will for motor purposes, and that its operation for the latter purpose is as simple as for incandescence, which is done by the mere turning of a key like a gas-cock. The funtion of electricity as a motor for household purposes will be hardly less useful than its value in illumination.

The great problem to be solved, however, by the physicist and electrician, before the art of electrical application attains its ultimate triumph, is the direct production of electrical energy from coal. The dream of certain French and German scientists that it may be transformed directly from the solar energy is a wild chimera, or at least it is remote and untrustworthy; but that it will be derived in some simple and inexpensive way directly from coal, which is solar heat and light stored up by nature, the writer believes to be a certain fact. The present methods of producing electricity are at their best very cumbersome and expensive. Expensive boilers, engines and dynamo-machines are the media through which the carbon of the coal is transmuted into electricity and with enormous waste at that. A large amount of expensive labor, is needed, so that with the cost of the plant and of the labor to operate it, the ultimate product is very costly. Once, however, the secret of the direct production of the electrical energy from coal is discovered, a marvelous revolution will take place. The cost to the consumer then will be very small. From one great central station in a city electricity will be furnished to give light, heat and power to houses, stores, public buildings, factories and workshops, and at so reduced a cost as to materially lessen the expenses of life and work. This is something more than a dream. It is a future fact which many now living will probably see realized. Such a direct transformation of coal into electricity would utilize 80 per cent.; now by the process of turning the energy of carbon into heat, heat into energy of motion, and this into electrical energy of at least 90 per cent.

Electricity as a motive power will not be confined to household or factory purposes. It has already been successfully used (for experimental purposes) at Berlin, Paris, Port Rush (Ireland), and by the writer at Menlo Park as a motive power on a railroad. These various experiments have perfectly proven the practicability of the electric locomotive and indicate that it will be largely adopted in the future in place of the steam locomotive.

* * * * * * *

The vast deposits of rebellious ores, which

for the want of an economical method of working are to-day practically useless, will probably at some date not far hence yield to man the precious metal they contain by assistance of electricity. Though the experiments have not been very successful, enough has been done to show that there will be eventual success.

Such, briefly told, are the marvels of electricity, as already accomplished, or as marked out on the sure lines of scientific foresight. If the story could have been told as a prophecy fifty years ago it would have dazed even the most adventurous mind. Yet the other half of the story hidden behind the veil will not be a jot less wonderful. The writer, in reviewing what he believes from a long and absorbing study of the problems of electricity, has only touched on those phases of development which experiment has shown to be within the grasp of the scientific inventor. To discuss its possibilities would bring into play a line of speculation seemingly more akin to the dreams of the poet than to the sober judgment of the practical worker.–*N. Y. Tribune.*

Electric Lighting for Railway Carriages.

(From the *London Electrical Review.*)

In the *Electrical Review* for January 12 of last year we commented at some length upon two systems which had been brought forward for providing our railway carriages with an effective light by the application of electricity. One method was that of employing a dynamo and driving engine combined and carried by the locomotive, the boiler of the latter supplying steam; the other consisted of a combination of dynamo and accumulators, the generator of the electric current being driven by means of belting from the axle of part of the rolling stock.

We stated at the time that anything electrical in connection with railway operations should be of the most simple nature, and that we should therefore be inclined to place most confidence in that system which apparently offered the least chance of failure. It is therefore not a little gratifying to find our views generally supported by such well-known men as Messrs. W. H. Massey, Gisbert Kapp, and R. E Crompton, although we must, in justice to the advocates of the accumulator system, admit that Messrs. Stroudley and Houghton have been most successful in the application of the dynamo-accumulator combination. In the method first mentioned, the objection that lights are extinguished whenever it may be necessary to uncouple the locomotive engine which carries the dynamo was naturally raised. Mr. Massey meets this by remarking that such a contingency ought not to weigh with those who know from experience that it makes little or no difference in well-lighted stations whether the carriage lamps are lighted or not. This argument is ingenious, but fails from the fact that we do not yet possess the well-lighted stations which would diffuse sufficient illumination through any carriages there standing. Mr. Kapp goes further and makes a practical suggestion for meeting the difficulty. This gentleman, in the correspondence columns of a contemporary, says there is no reason whatever why the lights should be extinguished for a single instant, although the train might be left standing without its locomotive for any length of time. All that would be required would be a dynamo fixed in the station where the trains are made up, and the provision at suitable places along the platforms of flexible twin cables in connection with the main leads from the dynamo. Some of the coaches in each train, or preferably all the coaches, should be provided with terminals connected to the main leads throughout the train, which would fit a clip attached to the end of each pair of flexibles. To prevent reversal of polarity, the clip should be so arranged that it would only go on one way, and the flexibles might be stowed away under the edge of the platform in the same way as are the India rubber gas pipes in Broad Street and other stations.

Immediately a train comes in the nearest flexible would be clipped on to any of the terminals within reach, and for the time being the train would be lighted jointly from the dynamo on the locomotive and from that fixed in the station. After detaching the locomotive, the station dynamo would continue to light the train until a new locomotive was coupled on. The dynamo in the station, with its engine, leads, flexibles and clips would be far cheaper, thinks Mr. Kapp, than a set of accumulators for every train, and would also have the additional advantage of serving at the same time for the permanent lighting of the station. Mr. Crompton adds: "I would call attention to the self-evident fact that electric lighting mechanism does not differ from other mechanism, in that trustworthiness and efficiency go hand in hand with simplicity and few parts. Again, although no prominent mention has hitherto been made of the fact, there is absolutely no comparison between the cost of direct running and of the van dynamo-accumulator system, the cost of the latter, whether for first cost or for maintenance, being quite double that of the former."

It appears, then, that the three gentlemen whose opinions we have quoted are all in favor of electric lighting being carried out without the addition of secondary batteries to the plant. The suggestion of Mr. Kapp is a novel one, but there are, we think, grave difficulties in the way of practically carrying out the scheme.

We imagine that in many instances there are stations in which trains are made up, or, at all events, where carriages are taken on and off, so unimportant in themselves as not to warrant the adoption of a dynamo and engine for permanently lighting the usual offices and platforms. There would, again, be considerable difficulty in preventing short circuiting or leakage from a set of flexible leads when used and stowed away in the manner of India rubber gas pipes, and the probabilities are that the station itself would frequently be left in darkness from such causes. Nevertheless, Mr. Kapp's idea is one which, for special cases, we are inclined to think worthy of a trial. The great advantage possessed by the present modes of lighting railway carriages is, especially so far as oil lamps are concerned, that each carriage is independent of its neighbors. In cases of a breakdown, or of more serious disasters, this is a desideratum, the importance of which can scarcely be over-estimated. Whether this will ever be accomplished by means of electric lighting remains to be seen, if so, it certainly will not be by the method of supply upon which we have just commented. Secondary batteries are being improved, and their weight, for producing a given effect, much reduced, and we can yet conceive each carriage supplied with three or four cells to work a low-resistance incandescent lamp so as to render each car independent of the rest. Such a scheme would, of course, necessitate the provision of charging stations, but if tram cars are to be propelled and lighted by the means pointed out by us a fortnight ago, and Mr. Reckenzaun's recent experiments appear to point to such a happy result, what is to prevent the latter application, eventually, to railway trains?

Improvements in nearly all branches of the applications of electricity have been so rapid and important that it is rather venturesome in the present day to give decided opinions on any matter which is not already well established. We will, therefore, only add that we trust the new year will provide abundant opportunities for the fair and impartial trials of every system which promises good and lasting results.

* * The Western Electric Manufacturing Company, of Chicago, are making a multiple-switchboard for Stockholm, Sweden; putting in a 50-light plant for the Western Indiana depot, Chicago; a 25 light plant for Commodore Davidson's new opera house and skating-rink, St. Paul, Minn., and another 25-light plant for Rand, McNally Co., Chicago. This company recently shipped a 12-light plant to Antwerp, Belgium, and a 12-light plant to South Melbourne, Australia. In the other branches of their business they are fitting up the new Montezuma Hotel, at Las Vegas, New Mexico, the new Windsor Hotel, at New Orleans, La., and Hotel Royal at the same city.

—— Electric light plant is being put down by Messrs. Heenan and Froude, of Manchester, England, for lighting railway carriages on the Great Eastern Railway. Seven trains have been running since October 1st without a hitch. The dynamos are driven by Messrs. Heenan and Froude's high-speed spherical "Tower" engines, engines and dynamos being 3 feet 3 inches long over all, by 13 inches wide, and 2 feet high. They are placed on the locomotive boiler behind the dome, and clear of the side view of the driver, as it occupies a center position on the boiler. Steam is taken from the dome, and exhausts by the chimney. The wires and lamps are so arranged as not to prevent oil lamps from being put in at a moment's notice in the event of a train being divided from the main, and run on to a branch line; but the Great Eastern Railway Company contemplates applying the electric light to the whole of its trains.

—— The electric illumination of the new municipal hospital at Havre is just completed. The buildings are not favorably situated for the purpose, as they form a series of distinct pavilions separated by some considerable distance from one another. The conductors, therefore, have a total length of 6,000 to 7,000 meters (3.7 to 4 3 miles), the greater part being underground. Cruto incandescence lamps, manufactured by the firm of Milde, are used. In the wards each lamp has a reflector; seven wards have three lamps each, five have two lamps, and four have one lamp. There are besides in the kitchen and in an adjoining room three suspended fittings, each carrying four lamps. The outdoor lights are formed of groups of two, four, or five lamps enclosed in lanterns of the form of the street lamps of Paris. To prevent the rain falling upon the lamps, there has been added to the lantern a kind of cone of enamelled iron, which serves at the same time as a reflector. At the garden gate there are two lanterns of five lamps, and two similar lanterns light the chapel; the alleys and promenades are, further, lighted by one chandelier of five lamps, two of four lamps, and thirteen of two lamps. The current is furnished by two Gramme machines, compound-wound, and the result is very satisfactory. The installation has been erected by the firm of Milde, under the direction of their engineer, M. Desroziers, and of their Havre representative, M. Bricard.

* * The following statistics of Krupp's establishment at Essen are of interest. In 1860 Herr Krupp's factory at Essen employed 1,764 hands; in 1870 the number of workmen had risen to 7,084, and the present number is about 20,000. Including the wives and children of the employed, we have 65,381 souls depending for their subsistence on Krupp's works, 20,000 of these inhabiting houses belonging to Herr Krupp. The whole establishment comprises altogether eight sections; 1. The factories at Essen. 2. Three coal mines at Essen and Bochum. 3. Five hundred and forty-seven iron mines in Germany. 4. Several iron mines in the north of Spain, in the environs of Bilbao. 5. The blast furnaces. 6. A range at Meppen, 17 kilometers in length, for gunnery experiments 7. Other smaller ranges. 8. Four steamers for marine transport. The number of blast furnaces in use is 11, of other furnaces, 1,542. There are 439 steam boilers, 82 steam hammers, and 450 steam engines, 185,000 horse-power altogether. At Essen alone the works are fitted 59 kilometers of rails, 28 locomotives, 883 wagons, 69 horses, 194 carts, 65 kilometers of telegraph lines, 35 stations, and 55 Morse apparatus. At present the Krupp works are engaged in manufacturing for the Italian Government a monster gun, which will weigh 130,000 kilogrammes (say 130 tons), and for the transportation of which two wagons have been constructed, each able to bear a weight of 75,000 kilogrammes.

ELECTRIC LIGHT NEWS

—— It was intended to considerably extend the partial use of the electric light in the House of Commons before next session; but the Autumn session has prevented the work from being carried forward.

—— The latest idea of the Ameer of Afghanistan is to illuminate Cabul by the electric light. It is stated that he has sent some officers to Bombay to make the necessary arrangements.

—— The Sperry Electric Light, Motor and Car Brake Company, of Chicago, have just started the illuminating station in the Grannis Block, that city. The capacity of the present installation is 120 lights.

—— The directors of the Electric Light Company in Trenton, N. J., held a meeting last week and organized by the election of the following officers: President, Jas. Moses; vice-president, Joseph T. Ridgway; secretary, Alex. C. Yard; treasurer, Richard A. Donnelly; superintendent, Ellis A. Apgar.

—— A great difficulty has always existed among bakers to get a light into their dark ovens, so that the progress of baking might be observed, but a recent trial of the electric light in an oven where the temperature ranged from 400 to 600 degrees proved entirely successful. A plate glass door is put in the oven, through which the bread or pastry may be seen.

—— The lighting of a portion of the business and fashionable quarter of Berlin by electricity has gained many friends. The contract with Messrs. Siemens and Halske, which has been several times renewed, expires on the 1st of March, 1885, and the authorities, in view of the general approval, intend to continue the lighting. It is not known whether the town authorities will undertake it themselves, or hand it over to private undertakers, more than one of whom have tendered.

—— "When I came into this department twenty-one years ago," said Capt. Rodier, in charge of the U. S. Treasury branch printing office in Washington, "we used tallow candles. Then we had lamps and then gas, and now comes the electric light. The United States Electric Light Company has placed in the basement of the Treasury Department, where the printing office is situated, one hundred Weston incandescent lights to supersede gas, and we are greatly pleased with the change. We now have all the light desired, and also pure air."

—— The annual meeting of the stockholders of the Citizens' Electric Illuminating Company, of Brooklyn, N. Y., was held at the office of the company, No. 340 Fulton Street, January 7. The following gentlemen were elected trustees for the ensuing year: Henry W. Pope, Hugh McLaughlin, John Delmar, C. H. Sewall, James E. Brown. At a meeting of the trustees H. W. Pope was elected president; C. H. Sewall, vice-president; Hugh McLaughlin, secretary and treasurer; Anthony Barrett, counsellor.

—— The Australasian Electric Light and Power Company has prepared a return of the lighting it has done in various parts of Australasia, and also of the work done by the Australian and Edison Indian and Colonial Companies. The first-named has carried out 32 installations, employing 319 arc and 1,295 incandescent lights, and of these 10 have resulted in loss, and 14 in profit, the remainder being in progress. The Australian Electric Company has carried out 16 installations, in which an aggregate of 60 arc and 2,132 incandescent lights are used, and has effected sales of lighting plant in 15 cases to a large extent to various mining companies.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JANUARY 13, 1884.

310,558 Cable, or electric railway yoke or frame; Chester Bullock, New York, N. Y.

310,587 Printing telegraph; George M. Hathaway, New York, N. Y., assignor to Hathaway's Printing Telegraph and Telephone Company.

310,630 Electric arc lamp; Leonidas G. Woolley, Indianapolis, Ind., assignor to the Ohio Power and Light Company, Dayton, Ohio.

310,663 System of electric lighting; Oscar Gassett, Boston, Mass.

310,664 Apparatus for distributing electricity; Oscar Gassett, Boston, Mass.

310,665 Apparatus for the distribution of electricity; Oscar Gassett, Boston, Mass.

310,684 Means for overcoming static disturbances in telegraphy; Francis W. Jones, New York, N. Y.

310,685 Quadruplex Telegraph: Francis W. Jones, New York, N. Y.

310,724 Secondary battery and means of transporting the same; Lebbens H. Rogers, New York, N. Y.

310,733 Electrode dumbbell for electrical exercising apparatus; James H. Shaw, New York, N. Y.

310,736 Electric arc lamp; Sidney H. Short, Denver, Col.

310,748 Underground housing and insulation for electric conductor; Eli C. Townsend, New York, N. Y.

310,749 Combined spring jack and annunciator; Louis Townsend and Robert W. Moore, Evansville, Ind.

310,750 Combined annunciator and spring jack; Louis Townsend, Evansville, Ind.

310,751 Telephone; Henry E. Waite, New York, N. Y., assignor to Charles F. Livermore, same place.

310,761 Manufacture of incandescents; Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N.Y.

310,762 Dynamo-electric machine; Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y.

310,763 System of generating and regulating electric currents; Edward Weston, Newark, N J., assignor to the United States Electric Lighting Company, New York, N. Y.

310,781 Regulator for electric arc lamps; Hermann R. Bossier, New York, N. Y.

310,780 Brush holder for dynamo-electric machines; Hermann R. Boissier, New York, N. Y.

310,782 Dynamo-electric machine; Herman R. Boissier, New York City, N. Y.

310,783 Cut-out for electric arc lamps; Hermann R. Boissier, New York, N. Y.

310,831 Galvanic battery; William K. Kidder, New York, N. Y., assignor to the Jerome Kidder Manufacturing Company, same place.

310,837 Electric arc lamp; Norman McCarty, Hoosac, N. Y., assignor to J. B. Tibbitts, same place.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40.00. Various other Foreign patents may also be obtained.

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